IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 4, April 2024

DOI: 10.17148/IJARCCE.2024.13466

Skin Care Disease Analysis and Detection Using Machine Learning

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Abstract: 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, Color, Diameter, (ABCD) etc., feature selection using Principal component analysis (PCA), calculating total Dermoscopy Score and then classification using Convocation neural network (CNN). results show that the achieved classification accuracy is 92.1.

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

I. INTRODUCTION

1.1 Motivation

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.

1.2 Problem Definition

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.

1.3 Methodologies of Problem Solving

Methodology –

Convolutional Neural Network: Convolutional Neural Networks specialized for applications in image and video recognition. CNN is mainly used in image analysis tasks like Image recognition, Object detection Segmentation. There are Four types of layers in Convolutional Neural Networks:
1) Convolutional Layer: In a typical neural network each input neuron is connected to the next hidden layer. In CNN, only a small region of the input layer neurons connects to the neuron hidden layer.
2) Pooling Layer: The pooling layer is used to reduce the dimensionality of the feature map. There will be multiple activation pooling layers inside the hidden layer of the CNN.
3) Flatten: -Flattening is converting the data into a 1-dimensional array for inputtingitto the next layer. We flatten the output of the convolutional layers to create a single long feature vector.

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4) Fully-Connected layer: Fully Connected Layers form the last few layers in the network. The input to the fully connected layer is the output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer.

Problem Solving –

The tumor can't always be removed completely. When it's possible, the surgeon works to remove as much of the brain tumor as can be done safely. Brain tumor removal surgery can be used to treat brain cancers and benign brain tumors. Some brain tumors are small and easy to separate from surrounding brain tissue.

II. LITERATURE REVIEW

A. A Fully Automated Method for Skin Nodule Detection FromPostero- Anterior Chest Radiographs

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 radiographs, 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. The segmented area is processed with a simple multiscale method that enhances the visibility of the nodules, and an extraction scheme is then applied to select potential nodules. To reduce the high number of false positives extracted, cost-sensitive Convocation neural networks (CNNs) are trained to recognize the true nodules. Different learning experiments were performed on two different data sets, created by means.

B. An Approach for Discretization and Feature Selection of Continuous- Valued Attributes in Medical Images for Classification Learning

Many supervised machine learning algorithms require a discrete feature space. In this paper, we review previous work on continuous feature discretization and, identify defining characteristics of the method. We then 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.

C. Generating Synthetic Medical Images by Using GAN to Improve CNN Performance in Skin Cancer Classification

One of the main reasons of slow progress in using deep learning methods for cancer detection is the lack of data, especially the annotated data which is usually used for supervised learning algorithms. This paper presents a Convolutional Neural Network (CNN) to detect skin cancer. The primary database which is used to train the designed CNN algorithm has 97 members (50 benign and 47 malignant), which are collected from the International Skin Imaging Collaboration (ISIC). In order to compensate the lack of data for training the proposed CNN algorithm, a Generative Adversarial Network (GAN) is designed to produce synthetic skin cancer images. The classification performance of the designed trained CNN without the obtained synthetic images is near 53, but by adding the synthetic images to the primary database the performance of the model is increased to 71.

D. A Method for Melanoma Skin Cancer Detection Using Dermoscopy Images

Now days, Skin cancer is life threatening disease which causes human death. Abnormal growth of melanocytic cells causes a skin cancer. Due to malignancy feature skin cancer is also known as melanoma. Melanoma appears on the skin due to exposure of ultraviolet radiation and genetic factors. So melanoma lesion appears as black or brown in color. Early detection of melanoma can cure completely. Biopsy is a traditional method for detecting skin cancer. This method is painful and invasive. This method requires laboratory testing so it is time consuming. Therefore, in order to solve the above stated issues computer aided diagnosis for skin cancer is needed. Computer aided diagnosis uses Dermoscopy for capturing the skin image. In this paper first pre-processing of the skin image is done. After pre-processing lesion part is segmented by using image segmentation technique which is followed by feature extraction in which unique features are extracted from segmented lesion.

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III. 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. METHODOLOGY

1] Requirement gathering and analysis:

In this step of waterfall, we identify what are various requirements are need for our project such are software and hardware required, database, and interfaces.

2] System Design:

In this system design phase, we design the system which is easily understood for end user i.e., user friendly.
We design some UML diagrams and data flow diagram to understand the system flow and system module and sequence of execution.

3] Implementation:

In implementation phase of our project, we have implemented various module required of successfully getting expected outcome at the different module levels.
With inputs from system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.

4] Testing:

The different test cases are performed to test whether the project module is giving expected outcome in assumed time. All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

5] Deployment of System:

Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.

6] Maintenance:

There are some issues which come up in the client environment. To fix those issues patches are released. Also, to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment. All these phases are cascaded to each other in which progress is seen as flowing steadily downwards like a waterfall through the phases. The next phase is started only after the defined set of goals are achieved for previous phase and it is signed off, so the name “Waterfall Model”. In this model phases do not overlap.

V. SYSTEM ARCHITECTURE

A. System Architecture

A system architecture is the conceptual model that defines the structure, behavior, an architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. A system architecture can consist of system components and the sub-systems developed, that will work together to implement the overall system. There have been efforts to formalize languages to describe system architecture, collectively these are called architecture description languages

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B. Mathematical Model

Let S be the Whole system S= I, P, O
I-input
P-procedure
O-output
Input (I)
I= skin Images
Where,
Images -¿ classicication images
Procedure (P),
P=I, Using I System perform operations and calculate the detect skin disease. also, weather information is calculated.
Output(O)-
O=System detects skin disease

C. Data Flow Diagram

In Data Flow Diagram, we Show that flow of data in our system in DFD0 we show that base DFD in which rectangle present input as well as output and circle show our system, In DFD1 we show actual input and actual output of system input of our system is text or image and output is rumor detected likewise in DFD 2 we present operation of user as well as admin.

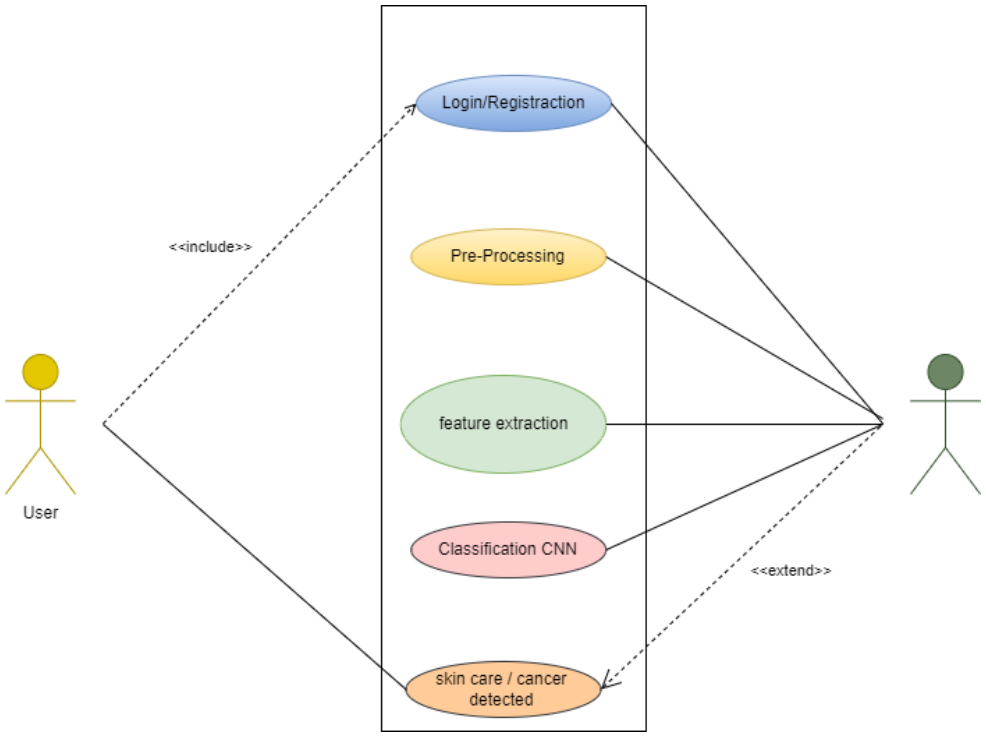

Fig.1 – Use Case Diagram

VI. RESULTS

Analyzing skin diseases and conditions using machine learning can yield promising results in terms of accuracy and efficiency. The final results of such a system would depend on various factors including the dataset used for training, the algorithms employed, and the evaluation metrics chosen. Here's a generalized overview of what the final results might entail:

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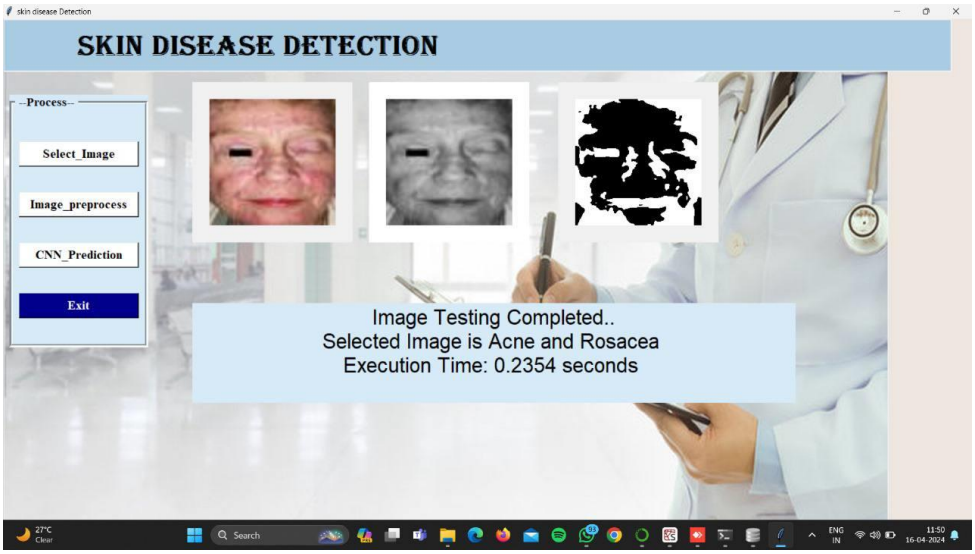

VII. CONCLUSION

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 region 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.

ACKNOWLEDGMENT

We are very grateful to **Prof. Savita Mogare** (Guide and Assistant Professor of Department of Information Technology, Sandip Institute of Technology and Research Centre, Nashik) for her expert guidance and continuous encouragement throughout the project.
At last, we must express our sincere heartfelt gratitude to all the staff members and students of Information Technology Department who helped us directly or indirectly during this course of work.

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