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Common Skin Disease Diagnosis and Prediction

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Abstract - *The integration of computer technology into the healthcare industry has been driven by the proliferation of electronic data. Skin diseases, which can range from common to rare disorders, present a unique challenge for medical professionals in terms of diagnosis. Machine learning and deep learning algorithms have shown potential for improving the early detection of high-risk skin disorders and displacing traditional diagnostic systems. This paper aims to evaluate the performance of various machine learning and deep learning models in diagnosing skin diseases by analysing performance indicators. We trained our model using deep learning, a type of machine learning that leverages large data sets, reducing the need for multiple classifiers. This approach enhances dermatology by allowing the machine to continuously learn, categorize input data into appropriate prediction levels, and provide accurate results in a timely manner. Our model utilized Convolutional Neural Network (CNN),MobileNet, Residual Neural Network (ResNet) a widely used method for image classification.*

***Key Words*: Skin Disease, Machine Learning, Deep Learning, Neural Network, Convolutional Neural Network (CNN)**

1.INTRODUCTION

Dermatology is a complex and challenging field due to the diversity of diseases that affect the hair, skin, and nails. These diseases are influenced by various environmental and genetic factors, leading to different symptoms and prognoses. Some diseases, like eczema and psoriasis, are chronic and incurable, while others, like malignant melanoma, can be life-threatening if not detected early.

Deep learning is a subfield of machine learning that utilizes large datasets to reduce the number of classifiers needed for the learning process. Unlike traditional machine learning, deep learning algorithms have the ability to automatically select and extract features, making predictions easier for end users with minimal pre-processing. Convolutional Neural Networks (CNNs) are a popular type of artificial neural network used in image recognition and classification tasks. They have been shown to be effective in recognizing faces, objects, and traffic signs, and are also used in areas such as robotics and self-driving cars.

Skin diseases are becoming increasingly prevalent, affecting people of all ages. In order to detect these diseases, we utilized a CNN, a type of deep neural network that has the ability to independently learn and categorize data into prediction levels, producing accurate results quickly. The most commonly occurring diseases in the data set include melanocytic nevi, melanoma, benign keratosis-like lesions, basal cell carcinoma, actinic keratoses, vascular lesions, and dermatofibromas. Despite their prevalence, diagnosing these diseases is complex due to the variations in skin tone, color, and hair.

Skin disease is the most common disease in the world. Diagnosing a skin disease requires a high standard expertise and accuracy for a dermatologist, so the computer-aided skin disease diagnosis model is designed to provide more objective and reliable solution. Much research has been done to help detect skin diseases such as skin cancer and skin tumors. However, accurate disease recognition is extremely challenging for the following reasons: low contrast between them lesions and skin, visual similarity between diseased area and non-diseased area, etc. The aim of this article is to detect skin disease from skin image and gray scale the image using alter to remove noise or unwanted stuf to analyze this image help with processing and get useful information. This helps to provide evidence for any type of skin disease and they show the emergency orientation. The result of the

analysis of this study can help the doctor to help in the initial diagnosis and to know the type of disease. It is compatible with the skin and prevents side effects.

2. Literature Survey

Skin diseases occur in almost all age groups of people. There are chronic and incurable diseases such as eczema and psoriasis and malignant diseases such as malignant melanoma. Recent scientists have found the availability of drugs for these diseases if they are detected in the early stages. It has been published for the detection of these diseases using an image processing method. The most dangerous form of skin cancer among other types of skin is melanoma. Skin diseases are often difficult to detect at an early stage and even more difficult to classify on their own. Image classification is one of the classic problems in image processing. This article gives us an overview of the existing machine learning and image processing algorithms for skin disease detection through Android application development. One in five people in the US is infected with some kind of skin disease. There are chronic and incurable diseases such as eczema and psoriasis and malignant diseases such as malignant melanoma. To detect these diseases using the image processing method. Skin disease detection methods using methods such as Naïve Bayes, CNN, SVM were used. The most dangerous form of skin cancer is melanoma because it is much more likely to spread to other parts of the body if not diagnosed and treated early. The literature review shows that CNN and SVM are the most suitable algorithms for the detection of skin diseases. In these articles, we have used OpenCV image processing along with machine learning algorithms to detect various skin diseases. The application also provides the doctor with a control panel to manage his patient remotely and can identify the patient's illness at a remote location. There are approximately 2.3 billion Android devices in use worldwide, which is 1/3 of the total world population. In short, identifying the disease can help reduce the problem of the spread of skin diseases. This will provide an inexpensive method of medical treatment. Most skin diseases can be easily spread by touch. In our application, we used a modified pre-trained convolutional neural network model and SVM algorithm. For the classification of six classes, 92% accuracy is achieved.

A new system has been developed for the diagnosis of the most common skin lesions. 93% accuracy is achieved in classification using Convolution Neural Networks (CNN) with Keras Application API. The watchword in these steps is "Data Preprocessing and Enhancement: Trash In-Good Out". They examined various properties of the data set, their distributions, and actual counts. Data transformation involves converting data from one format to another. Model Building involves building a deep neural network (CNN or ConvNet). Backpropagation is a strategy in artificial neural networks (ANN) to find out the error contribution of each neuron after processing a burst of data. Backpropagation is quite sensitive to noisy data. Data cleaning is performed to remove null values, smoothing noisy data by identifying or removing outliers, and removing inconsistencies. Skin cancer-MNIST (Modified National Institute of Standards and Technology Database)-HAM 10000.dataset is been used. Artificial Neural Network (ANN) & Back Propagation Network (BPN) are used in this research. In conclusion, the work presents a robust automated method for the diagnosis of dermatological diseases in the European Society of Medical Oncology. Skin diseases are the fourth most common cause of human disease, but many still do not consult a doctor. We should emphasize that it is intended to replace doctors, because no machine can yet replace human input into analysis and intuition.

In order to forecast numerous skin disorders that are prevalent yet challenging to detect owing to complications such skin tone and colour, this study provides a computer vision-based solution employing deep learning. The algorithm predicts skin illnesses based on the highest number of votes using three modified, freely accessible image recognition models (InceptionV3, InceptionResnetV2, and Mobile Net). These models undergo a three-stage process of feature extraction, training, and testing/validation before being pre-trained to recognise 1000 classes using skin photos. The technology aims to anticipate skin disorders with the greatest possible precision. Due to the wide range of illnesses affecting the skin, hair, and nails as well as the difficulties in diagnosing these illnesses, dermatology is a complicated and unreliable branch of study. For the proper diagnosis of skin disorders, a variety of pathological laboratory tests are required. , however, this research suggests a technique that enables users to forecast skin problems using computer vision without requiring time-consuming laboratory tests. The study outlines a method for predicting skin conditions using computer vision and deep learning. With changes for skin disease prediction, the system leverages three publically accessible image recognition architectures (InceptionV3, InceptionResnetV2, Mobile Net) and predicts the illness based on the combination of votes from the three networks. The technology aims to anticipate skin illnesses as accurately as possible. Due to advancements in medical technology and computers' capacity to handle and analyse massive volumes of data, the use of computer technology in the detection of skin disorders has increased. The study emphasizes the use of supervised, unsupervised, and semi-supervised learning techniques for this purpose, concentrating on machine learning and deep learning algorithms. Three parts make up the proposed computer vision system for predicting skin diseases: feature extraction, training, and testing/validation. The method employs deep learning technology to extract significant characteristics from photos of skin diseases during the feature extraction phase. These architectures have been pre-trained to identify up to 1000 classes of pictures. The system checks the algorithm using validation

data during the test/validation phase in order to determine how accurate it is at predicting skin diseases. To forecast skin problems, the algorithm takes the most votes from the three networks. The major objective of this method is to forecast skin diseases as accurately as possible. In comparison to manual, time-consuming approaches that call for specialized expertise, the system employs computer vision and deep learning to deliver a more effective and automated method for identifying skin diseases.

3. Proposed Work

3.1 System Architecture

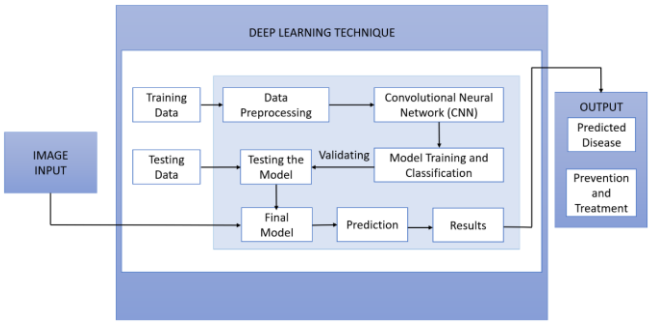

Fig -1: Proposed System Architecture

3.2 System Design

3.2.1 Data Collection - The skin disease detection system was evaluated using images from the publicly available Skin Cancer-MNIST (Modified National Institute of Standards and Technology Database)-HAM10000 dataset. To save time and effort, publicly available data was utilized.

3.2.2Data Pre-processing - To ensure accurate results, the first step in data processing was cleaning the data. This included filling in missing values, smoothing noisy data, identifying, and removing outliers, and removing inconsistencies. During pre-processing, the image data was transformed into meaningful tensors and fed into the convolutional neural network.

3.2.3 Data Transformation - This involves converting data from one format to another, such as transforming actual values from one representation to another.

3.2.4 Modelling - A convolutional neural network (CNN) was used. CNNs are a type of deep neural network where the machine itself learns to divide the data into prediction levels and produce accurate results in a short time. This network consists of a combination of convolutional layers, pooling layers, and fully connected layers. CNNs are the most effective algorithm for image classification, with features such as sparse connectivity, shared weights, and pooling capabilities playing a critical role in obtaining the best results. Additionally, the use of GPUs has reduced the training time of deep learning methods, and huge data labelled and pre-trained networks are now publicly available.

3.2.5 ResNet - Residual Neural Network (ResNets) is a common neural network architecture used for deep learning computer vision applications such as object detection and image segmentation. Residual Network (ResNet) is a convolutional neural network (CNN) architecture that has overcome the "vanishing gradient" problem and allowed networks with up to thousands of convolutional layers to be built that outperform shallower networks.

3.2.6 MobileNet - It is a type of convolutional neural network designed for mobile and embedded vision applications. They are based on a simplifed architecture that uses depth-separable convolutions to build lightweight deep neural networks that
can have low latency for mobile and embedded devices. Due to the small size of the model, these models are considered very useful for implementation on mobile and embedded devices. Hence the name MobileNet. The _rst layer of MobileNet is a full convolution, while all subsequent layers are depth-separable convolutional layers. All layers are followed by batch normalization and ReLU activation. The last classification layer has softmax activation. MobileNet-v2 is a convolutional neural network that is 53 layers deep. You can load a pre-trained version of the network trained on over a million images from the ImageNet database.

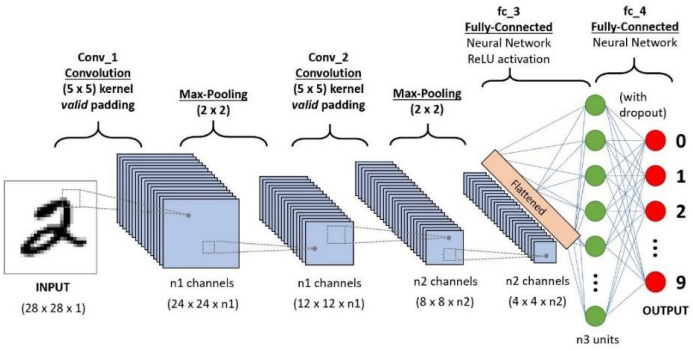

Fig -2: Simple CNN Architecture

3.3 Scope and Constraints

The skin is the largest organ in the human body, which is important for covering the human bone and for protecting the person from any damage, fighting bacteria and other types of diseases and can have several potential abnormalities. Several factors they can directly or indirectly

affect the skin and cause diseases that can be treated with special drugs and that require other consultations with a doctor. This document will help people to know what the required procedures for the treatment of skin diseases by analysing the image and extracting useful information to help visualize the infected skin area and classify the image based on the type of skin disease.Image recognition is a big challenge, Dealing with blur images, images should not be blurred and should be in proper format and angle.Images should be taken in an illuminated area. It does not support GIF or video format. Images other than human skin should not be included. Only seven common skin diseases are detected.

4. Implementation

4.1 Pre-processing - This is Skin Cancer HAM10000 MNIST dataset with 10000+ skin disease images of seven different diseases downloaded from kaggle. The dataset is a csv file with 10015 images consist of 64 by 64-pixel images in rgb format. Here, label column is considered as target variable (Y) and rest columns as independent variables(X). The dataset is divided into 80 percent training and 20 percent testing using train test split method. The independent variables (X) are reshaped into 64 by 64 format and target variable (Y) is converted to categorical format.

4.2 CNN- Total 4 convolutional layers and pooling layers are used in the system with 1 attending layer and 4 fully connected layer and a output layer. Number of filters for first layer or input layer is 32 with kernel size of 3 by 3 and input shape of (64,64,3). The rest three convolutional layer has 64, 128, 256 filters respectively, the activation function used is Relu. Max pooling is used after each convolutional layer with pool size of (2,2). A attending layer is used to convert outputs to one dimensional array.
5. The fully connected layer has 4 layers and a output layer, numbers of neurons used are 256,128, 64, 32 respectively with Relu activation function and for output layer 7 neurons with softmax activation function. Model compiled using Adam optimizer and loss function categorical crossentropy, model is trained with epoch size 15. Train accuracy = 89 percent, validation accuracy = 73 percent, test accuracy = 72 percent.

4.3 Mobilenet - MobileNet is a transfer learning model used for image classification, input layer has input shape of (64,64,3) with weights as 'imagenet'.It has 85 pre de_ned layers, 4 new layers and a output layer. The _rst layer is dropout layer with value of 0.5, second is global average pooling layer. Next is a Dense layer with 128 neurons and Relu activation function and a Batch Normalization layer. output layer is a Dense layer with 7 neurons and Sigmoid activation function. Model compiled using Adam optimizer and loss function categorical crossentropy, model is trained with epoch size 5 and Early Stopping is used Train accuracy = 82 percent, validation accuracy = 73 percent, test accuracy = 73 percent.

4.4 ResNet - ResNet50 is a transfer learning model used for image classification, input layer has input shape of (64,64,3) with weights as 'imagenet'. It has 50 pre-defined layers, 3 new layers and a output layer. The first and third layer is dropout layer with value of 0.5. Second layer is a Dense layer with 128 neurons and Relu activation function. output layer is a Dense layer with 7 neurons and Softmax activation function. Model compiled using Adam optimizer and loss function categorical crossentropy, model is trained with epoch size 5 and Early Stopping is used Train accuracy = 80 percent, validation accuracy = 76 percent, test accuracy = 73 percent.

4.5 Android - Import Tensorflow lite model into android studio. Add Buttons for choosing images and prediction. choose image either from gallery or camera. reshape image to 64 by 64 pixel. Input image will be converted to 64,64,3 format. and will be provide to model as input. model will return oat array with probabilities and maximum value will be choose and displayed the corresponding disease name.

4.6 Working Module-

4.6.1Disease Detection: There are some skin diseases that are the most dangerous. We have selected several common skin diseases as experimental objects Disease problems certainly affect human skin along with other skin factors like hair. In this field, disease detection is an important step. If the disease is not detected at an early stage will lead to various harmful skin diseases like cancer, rashes, etc. Machine vision framework uses image processing techniques to perform such specific work, which is why image processing assumes an exceptionally significant job in their capabilities.

4.6.2 Recommendation based on diseases: The first model predicts the disease due to which skin is infected and then by displaying not only the disease name but also
gives recommendations that how to prevent the spread of this disease and which precautions should be taken to overcome this problem. It recommends to the user
what they should be done.

4. CONCLUSIONS

In this work, a model for the prediction of skin diseases using deep learning algorithms is created. It has been found that by using feature compounding and deep learning, we

can achieve higher accuracy and predict many more diseases than other previous models. Like the previous models, in this one area of use, we were able to report a maximum of six skin conditions with a maximum accuracy of 75%. According to the implementation of a deep learning algorithm, we can predict up to 20 diseases with an accuracy of 70 percent. This proves that deep learning algorithms have huge potential in real-world skin disease diagnosis. If an even better system with high-end system hardware and software is used with a very large data set, the accuracy can be increased considerably, and the model can be used for clinical experimentation as it does not have any invasive measures. Future work can be extended to make this model a standard procedure for the method of preliminary diagnosis of skin diseases, as it will reduce the time of treatment and diagnosis.

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