Integration of Machine Learning And Deep Learning For Skin Condition And Disease Prediction

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Abstract- *Skin conditions pose a significant threat to individuals worldwide. Skin diseases are fairly prevalent in organisms. Skin diseases are difficult to monitor and classify in the medical field. Because of the complexity of a person's skin and the infection's apparent proximity, it can be challenging to identify the specific type. For that purpose, we have used the Machine Learning and Deep Learning for predicting the disease. Both machine learning and deep learning are forms of AI. Simply put, machine learning is AI that can automatically adapt with minimal human intervention. Deep learning is a subset of machine learning that uses artificial neural networks to mimic the learning process of the human brain. In today's context, artificial intelligence (AI) is rapidly gaining popularity in the therapeutic field. For diagnostic purposes, numerous deep learning (DL) and machine learning (ML) techniques are utilized. The diagnostic process is greatly enhanced and expedited by these methods. To improve disease detection, a model that combines machine learning (ML) and deep learning (DL) was developed in this study. Classifications of skin diseases can be identified using a variety of machine learning methods. In this paper, we using the machine learning and deep learning algorithm for making the prediction of skin disease. Strategies like skin sample acquisition, sample preprocessing, image segmentation, and feature extraction make up fault detection. The main idea of this paper is to use more methods for segmentation, image processing, and classification, like CNN. Most importantly, diseases of the skin can be detected using digital image processing instead of direct diagnosis. touch with the skin. As a result, optimally tuned deep learning techniques must be used to create a fully automated method for skin cancer classification and segmentation.*

Keywords- CNN, Deep Learning, Pre-processing, Classification, Prediction.

I. INTRODUCTION

Skin diseases are often referred to as diseases that originate in the body or appear outside the skin. Some of them are very rare, while the other are common. Not only do they cause itching and pain in humans, they also have an emotional and social impact due to their visibility is proposed by [2]. Machine learning algorithms are widely used in medicine. Various classification algorithms for disease diagnosis have been developed to provide high accuracy in disease prediction. Many machine learning algorithms have been developed to predict different types of diseases at an early stage after looking at different attributes of the disease. These algorithms are widely used in breast cancer, kidney disease, thyroid disease, diabetes, other cancers, erythematous squamous cell disease, etc. In this study, we selected erythematous squamous cell disease for analysis is stated by [1]. Skin diseases are among the most prevalent diseases in the world. As is often the case, the complexities of skin tone, color and presence of hair make diagnosis very difficult. This paper provides an approach using various computer vision-based techniques (deep learning) to automatically predict different types of skin diseases is stated by [3]. Skin is an extraordinary human structure. It frequently suffered from many of known and unknown ailments. Skin is an extraordinary human structure. It has been observed that most of the cases go unnoticed due to the lack of better healthcare infrastructure and facilities. This paper is stated to solving this challenge is proposed by [4]. Some of the most common categories of skin cancer that exist worldwide are skin lesions, melanoma, etc. Manually diagnosing skin cancer is difficult and requires more time and money for diagnosis is proposed by [5]. A fusion of the ML and DL models is created in this study to diagnose skin abnormalities. Three sets of ML models were used for classification models: Decision Tree, SVM, and Ensemble Classifier sets of pre-trained deep neural networks were used for feature selection. Alexnet, Googlenet, Resnet50, and VGG16. Finally, we ran a series of experiments and selected the model with the best predictions is stated by [6].

In this paper, we using the integration of machine learning and deep learning in CNN. Fault detection consists of strategies that include skin sample acquisition, sample preprocessing, image segmentation, and feature extraction. The main proposal of this paper is to implement more techniques such as CNN, DML for segmentation, image processing and classification. Most importantly, by integrating

digital image processing to detect skin diseases, diagnosis can be performed without direct diagnosis. contact with skin. Therefore, there is a need to develop a fully automated methodology for skin cancer classification and segmentation using optimally tuned deep learning techniques. ANN is still dominant for problems where datasets are limited and image inputs are not necessary. Apart from that, spatial information is also lost when the image is smoothed due to the feed transfer process. ANN is not suitable for image processing tasks and also heavy datasets. Because it is very high accuracy in image recognition compared to ANN. The second section gives the literature review followed by the theory of the method. The fourth section gives simulation environment, experimental results, and performance metrics. The fifth section proceeds with the conclusion followed by the future enhancement.

II. RELATED WORKS

Anurag Kumar Verma et al.,[1] proposed as a machine learning algorithms are widely used in medicine. Various disease diagnosis classification algorithms have been developed to provide high accuracy for predicting disease. Many machine learning algorithms are developed for predicting various types of disease at early stages after examining the various attributes of the disease.

Jessica Velasco et al.,[2] proposed as the MobileNet model was used by applying transfer learning on the 7 skin diseases to create a skin disease classification system on Android application. The proponents gathered a total of 3,406 images and it is considered as imbalanced dataset.

Sourav Kumar Patnaik et al.,[3] proposed as Dermatological disorders are one of the most widespread diseases in the world. Despite being common its diagnosis is extremely difficult because of its complexities of skin tone, color, presence of hair. This paper provides an approach to use various computer vision based techniques (deep learning) to automatically predict the various kinds of skin diseases.

Ahmed A. Elngar et al.,[4] proposed as skin is an extraordinary human structure. It frequently suffered from many known and unknown disease. Therefore, diagnosis of human skin diseases is the most uncertain and complicated branch of science. It has been observed that most of the cases remain unnoticed because of the lack of better medical infrastructure and facilities. This paper is devoted to solve this challenge.

Kavitha S et al.,[5] proposed as a major issue for humans everywhere is a skin disease. Skin disease classification can be done using several methodologies of machine learning. Some of the common categories of skin cancer that exist in the world are skin lesions, melanoma, etc.

Samir Kumar Bandyopadhyay et al.,[6] proposed as living creature skin disease is a fairly prevalent ailment. In the medical world, monitoring dermatological disorders and classifying them is a complex process. Due to the sheer intricacy of individual skin tone and the visible proximity effect of infections, recognizing the precise type can be challenging at times.

Ashlesha Gaikwad et al.,[7] proposed as a skin diseases are considered one of the biggest scientific troubles in 21st century because of its especially complex and luxurious prognosis with problems and subjectivity of human interpretation. In cases of deadly illnesses like Melanoma prognosis in early tiers play a critical part in determining the possibility of getting cured.

Prabhakar Pawale et al.,[8] proposed as that research describes skin disease prediction by using a neural network based on image analysis. Diagnosis and prediction of skin disease take a very long process because it requires a patient's history, physical examination, and proper laboratory diagnostic tests.

Shaden Abdulaziz AlDera et al.,[9] proposed as Skin diseases are a global health problem that is difficult to diagnose sometimes due to the disease's complexity, and the time-consuming effort. In addition to the fact that skin diseases affect human health, it also affects the psycho- social life if not diagnosed and controlled early.

Kritika Sujay Rao et al.,[10] propose as the Dermatology is the branch of bioscience that's involved with diagnosing and treatment of skin based mostly disorders. The immense spectrum of dermatologic disorders varies geographically and additionally seasonally because of temperature, humidness and alternative environmental factors.

III. THEORY

The existing work is that the artificial neural networks (ANNs) are statistical nonlinear predictive modeling techniques used to learn complex relationships between inputs and outputs. The structure of ANN is inspired by the biological patterns of brain neurons. ANN has three types of compute nodes. ANN learns computations on at each node by backward propagation. There are two types of datasets, trained datasets and untrained datasets, and we keep the information set in a certain manner. Using a artificial neural network, the achieved accuracy in various studies is 80%, which is

suboptimal. In addition, ANN requires processors with parallel processing power. ANN produces probing solutions no indication as to why or how it happens undermines confidence in the network.

The proposed is that the process starts by collecting the dataset. The next step is to do Data Preprocessing which includes Data cleaning, Data reduction, Data Transformation. Then, using the Convolutional Neural Network (CNN) algorithm we will predict the skin disease. First they will develop an algorithm for efficient extraction and classification of Pigmented human Skin. And then to ease diagnosis and treatment of skin patient and provide for a cost-effective way of skin disease treatment and finally to improve the speed of diagnosing various kinds of skin diseases. Detection of disorder consists of strategies which include acquisition of skin samples, pre-processing of samples, segmentation of images, and extraction of functions. And most importantly, by integrating digital image processing for skin disease detection, we can perform diagnosis without making direct contact with the skin. Therefore, we must develop a completely automated methodology for skin cancer classification and segmentation through the most matched deep learning techniques. Initially, the images of skin diseases are preprocessed by removing unwanted hairs and noise before the segmentation. After that, we extract the lesion regions in the skin disease images by segmentation task. Then the classification is done by using the extracted features.

IV. RESEARCH METHODOLOGY

This research is being utilized to examine skin disease. A major issue for humans everywhere is a skin disease. Living creature skin disease is a fairly prevalent ailment. In the medical world, monitoring dermatological disorders and classifying them is a complex process. We searched 10 papers related to this topic. Literature survey has been done. Based on that survey, we are using the deep learning algorithm like DNN algorithm for making the prediction. Using this algorithm, we can able to make the prediction even more better. This algorithm is applied to skin disease dataset and then processing and evaluating the dataset and then results are presented. The appropriate conclusion is drawn. First, the dataset has been taken that are related to this domain. The collected data has been pre- processed. Divide the entire data into ratio. Now, Deep learning algorithm models are used to feature extraction from the training sample, and ML models are used to categorize them. Now analyzing the dataset for making prediction. Then finally prediction has been taken using the dataset along with the algorithm.

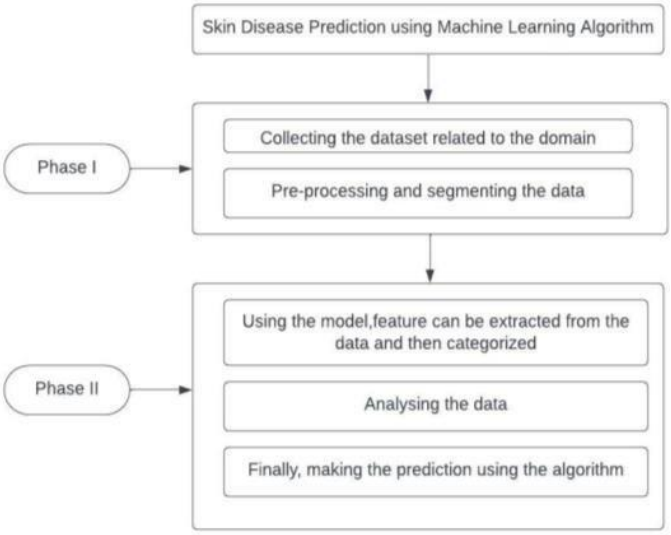

Fig1 Research Methodology

4.1. Algorithms Used

CNNs are mainly used to find patterns in images. You don't have to deeply understand and provide the right functionality. This is the main reason for using CNN for CNN related problems. A convolutional neural network is a feed-forward neural network commonly used to analyze visual images by processing the data in a grid-like topology. Also known as ConvNet. Convolutional neural networks are used to recognize and classify objects in images. A convolution neural network has multiple hidden layers that help in extracting information from an image. The four important layers in CNN are:

Step 1: A convolutional layer in a CNN passes the result to the next layer when a convolutional operation is applied to the input. CNN's convolutional layers are of great benefit because they ensure that the spatial relationships between pixels are perfect.

Step 2: The input image from the previous layer is smoothed and fed to the FC layer. The flattened vector goes through several more FC layers, usually with mathematical functions. In this phase the classification process begins. The reason for connecting two tiers is that two fully connected tiers perform better than a single connected tier. These layers of CNN reduce human oversight.

Step 3: A dropout layer is used to reduce the size of the model by removing some neurons from the neural network during the training process. Passing 0.3 dropout will randomly remove 30% of the nodes from the neural network. Dropout can improve the performance of machine learning models by

simplifying the network to prevent overfitting. Remove neurons from the neural network during training.

Step 4: This CNN model generalizes the features extracted by the convolutional layers, allowing the network to recognize the features individually. With its help, computations are also reduced in the network.

Step 5: Finally, one of the most important parameters of CNN models is the activation function. They are used to learn and approximate all types of continuous and complex relationships between variables in networks. Simply put, it decides which model information to send forward and which not to send at the end of the network.

4.2. Architecture Diagram

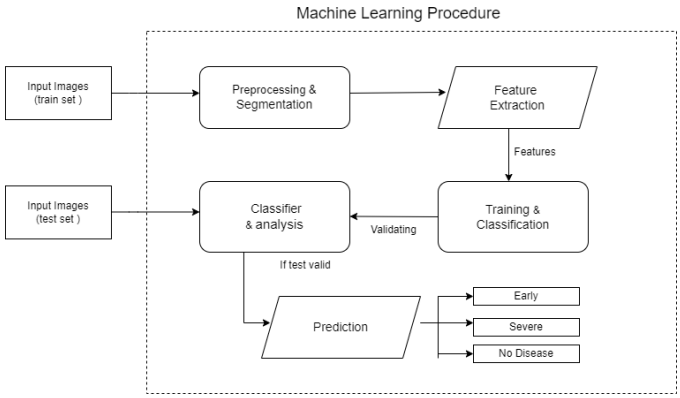

Fig2 Architecture Diagram

These are the steps involed in the following phases:

Image processeing: Image pre-processing helps you to format images to use in model training and inference. It is used for the enhancement of the images. Steps performed to format images before they are utilized in model training and inference are known as image pre-processing. Image resizing, orientation changes, and color adjustments are all included in image pre-processing.

Image segmentation: Image segmentation is the process of individually identifying and labeling every pixel in an image, where each pixel having the same label shares certain characteristics. It can detect an object at a granular level and it can identify the shape of that object also. It is an advanced and more accurate way of detecting an object's edge and shape detection. Image segmentation divides an image into different partitions known as segments. This collection of segments are represented by a mask or a labeled image. In this way, we can process only the important segments instead of the entire image.

Feature Extraction: The purpose of feature extraction is to create a new feature subspace by extracting new data from the initial feature set. Feature extraction's main purpose is to keep most of the relevant information while reducing the data. It creates new features from the existing ones by dropping the number of features in a dataset.

Classification: Dividing the given set of data into classes is the process of classification. Machine learning's classification task assigns a label value to a certain class and then determines if a particular kind belongs to one sort or another. Predicting a class label for a specific example of input data is what is referred to as a classification task. Machine learning classifiers calculate the likelihood or probability that new data will fall into one of the predefined categories using the input training data.

Prediction: After the classification phase, the model can be predict the disease using the classification. The prediction has been done using the Cross Value Based Model . It can help us to make more accuracy. Finally, the result can be displayed.

4.3. Performance Metrics

Here, we compare the ANN(Artifical Neural Network) and CNN(Convolutional Neural Network) for the better performance evaluation. The biological neural networks that shape the human brain are the source of the term "Artificial Neural Network." Artificial neural networks also have neurons that are connected to one another in different layers of the network, just like the neurons in the human brain. Nodes are the names of these neurons. The weighted sum of the inputs and a bias are computed by the artificial neural network after it receives input. A transfer function is used to represent this computation.

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The CNN is comparatively better than ANN. The comparative study is given in Figure 4

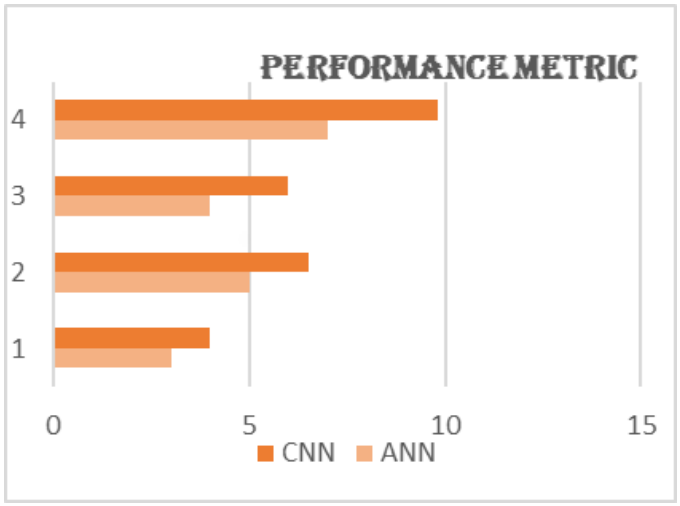

Fig 3 Performance Evalutaion between ANN and CNN

I assume you are already familiar with the classic neural network, the multilayer perceptron (MLP). When it comes to image processing, ANN has some drawbacks. ANN is still dominant for problems where datasets are limited and image inputs are not necessary. Apart from that, spatial information is also lost when the image is smoothed due to the feed transfer process. ANN is not suitable for image processing tasks and also heavy datasets. So, in this paper we using the integration of machine learning and deep learning in CNN. Because it is very high accuracy in image recognition compared to ANN.

V. CONCLUSION AND DISCUSSION

The epidermis is the largest natural human unit. Skin diseases can occur as a result of various environmental and internal factors. Detection of skin diseases is therefore an important part of medicine. It may reduce the number of deaths from skin diseases and infections. The therapeutic procedure takes a long time and does not always allow to correctly determine the nature of the disease. Under such circumstances, an automated method of diagnosing skin diseases is highly advantageous. This study proposes an electronic approach to the diagnosis of skin diseases. A hybrid of ML and DL models was employed to complete this process. In this proposed strategy, his four deep learning models for extracting features from training data were combined with three good machine learning classifiers. A computerized skin disease diagnostic system is proposed in this publication. The system will help Medical Society detect skin diseases early. The system helps dermatologists improve diagnosis time and accuracy of participation. This system of numerous complexity can be tested on large data sets in the future to obtain better efficiency of the algorithm. Also, the usage and demand of the system can expand the number of diseases that the system can detect to a significant amount. So, in this paper we using the integration of machine learning and deep learning in CNN. Because it is very high accuracy in image recognition compared to ANN..

VI. FUTURE SCOPE

Skin diseases are the fourth most common cause of diseases in humans, yet many people still do not seek medical attention. We presented a robust and automated method for diagnosing skin diseases. Skin treatments are more effective and less disfiguring when is detected early. It should be pointed out that this is intended to replace doctors. Because no machine can replace human analytical input and intuition. In the future, this machine learning model may be connected to various websites that can provide real-time data for skin disease prediction. You can also add extensive historical data on his skin disease to help improve the accuracy of the machine learning model. You can create an android app as his user interface for user interaction. To improve performance, we plan to carefully design our deep learning network structure, use adaptive learning rates, and train on data clusters instead of entire datasets. The future research will be extended for further improvement in skin disease recognition accuracy and work for real time human skin disease recognition.

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