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Detection of texture-based Skin disease using CNN

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Abstract

The recommended work aids in identifying the kind of skin condition the patient is suffering. Over the use of the patient's symptoms and precise vital signs data in the proposed system due to the elevated cost of healthcare, many are putting off getting sick. This could ultimately result in fatalities or other severe issues to minimize the effort required of a normal person. The main objective of this method is to estimate the type and degree of a person's ailment. We have created a machine learning system to forecast skin conditions built on the CNN algorithm. The patient provides a snapshot of the skin infection as input for the prototype. The project's objective is to detect the kind of skin issue and offer solutions in a timely and accurate manner.

Keywords: *Disease Prediction, Machine Learning Algorithm, Supervised Learning, Diagnosis System, User Interface*

1.Introduction

Every day, life on Earth changes, but is the current generation's health getting better or getting worse? There is a portion of uncertainty in life. We occasionally come across a large number of persons who have fatal health problems as an effect of illnesses being discovered later in life. For skin conditions and preventative measures, dermatologists are consulted in many developing nations [2]. Many people develop skin diseases as a consequence of genetics, occupation, malnutrition, living in certain environments, chemical exposure, etc. Climate, summer, and winter temperatures, among other environmental factors, also influence the prevalence of skin disease. People today tend to prioritize their appearance over their health, which has several negative effects. Forty percent of people ignore the symbols because they are scared of money problems or for other common reasons. The human skin is the major and utmost vital organ in the body. A humanist's skin-covered total body area is 20 square feet [1].
This system developed an automatic technique for classifying skin disease that can assist individuals in determining the specific type of pigmented lesion that has in-their skin.The goal of this project is to provide the overall community with information about the disease that is affecting their skin, enabling them to take proactive steps to improve it. In the proposed system we gave the image as the input type it detects the image and starts preprocessing using grayscale and canny edge detection methods after that segmentation is done using the thresholding technique, and then feature extraction is done based on color, texture, and thickness using inception v3 method then the last step is classification done by CNN model due to all these steps it will detect the disease and also detect the name of the disease.

2. Literature Survey

Ivan Bratchenko et al [1] In this work utilizes the classification of skin cancer using CNN analysis of Raman spectra Utilizing the study of Raman spectra with a strong autofluorescence background produced by a 785 nm laser, the projection on latent structures with discriminant analysis to differentiate cancer is also linked, as is the act of CNN. They have established organization representations for both convolutional neural networks and projection on latent structures approaches, and they have registered the spectra of 617 cases of skin neoplasms (615 patients, 70 melanomas, 122 basal cell carcinomas, 12 epithelial cell carcinomas, and 413 benign tumors) in vivo using a conveyable Raman setup. For each model that remained developed, 10-fold cross-validation was passed out to assess the constancy of the categorization model. To prevent over fitting of the model, the data was split into a training set (80%) to prevent overfitting of the model. Karthik R et al [2] Channel attention based on convolution neural network for skin disease classification. This paper works on the CNN model and by using the effcientNet method and also using CNN algorithm it evaluates the skin disease. RidhiArora et al [3] automated skin lesion segmentation using an attention-based deep convolution network. This paper deals with U-Net using normalization and practices encoder and decoder techniques owing to this it detects diseases so high-resolution images are needed. PawelBudura et al [4] Deep-learning method using deep-learning, this paper uses the HFUS method but it only works for automated tools so it builds an SLEB layer, it also works for only resolution images, not for all images. Joshua John et al [5]. This study uses the CNN model but performs only dermoscopic images, so they created two layers of classifiers due to this they can perform detection. The accuracy is 73%. Vinaygautham et al [6] Early skin disease identification using deep learning neural network identification and categorization of skin lesions stands as a major problem that is challenging even for highly qualified pathologists and dermatologists. The most prevalent condition that is brought on by bacteria, viruses, fungi, allergies, etic skin disease. is skin disease. The most dangerous illnesses are those that can cause major harm. As an outcome, an early diagnosis is necessary; nevertheless, the diagnosis therapy is complicated and requires sophisticated laser and photonic therapy. The rate of this advanced therapy is high, and there are additional negative consequences. As a result, it has to employ artificial intelligence methods to precisely identify and diagnose it early on. Many approaches have been used to identify skin conditions early on, but none of them have proven to be accurate. Thus, this paper's main objective is to categorize. Kamildimililes et al [7] Skin lesion classification using a CNN-based transfer model from the past ten years have seen a rise in the practice of deep learning models for skin lesion study and computer-aided diagnosis (CAD). Numerous datasets and deep-learning frameworks have been taken into consideration by the suggested CAD systems. RagavAgarwal et al [8] Skin disease classification using CNN algorithm. In the last few decades, dermatological disorders—especially those affecting human skin—have increased in frequency. The absence of a balanced diet, environmental conditions, socioeconomic issues, and other aspects have completely contributed to the rise in skin illnesses in recent years. Skin conditions can harm a person psychologically in a calculation to physically, especially if their face is scarred or deformed. Shamin Ahmed et al [9] Human skin detection and classification using CNN model in recent times, skin diseases have developed into cancers that pose a threat to normal human life. If any insignificant actions are taken during treatment, the condition will worsen and could even be the cause of death for people. Therefore, it is imperative to take the required actions as soon as a diagnosis is made in order to prevent the worst-case scenario— human death—especially in cases where the illness is melanoma skin cancer. [10] Jessica Valesco et al [10] This research aims to develop a scheme for detecting skin diseases employing a Convolution Neural Network (CNN). The (ECA) block

and Efficient NetV2 serve as the basis for the proposed model, Eff2Net. This study aims to replace the ECA block in the EfficientNetV2 model with a high-quality Squeeze and Excitation (SE) block. As a result, it was well-known for a strong demand for all trainable parameters.

3. Methodology

The proposed methodology includes the following sections: (i)Pre-processing (ii) Segmentation iii) Feature extraction(iv) classification model

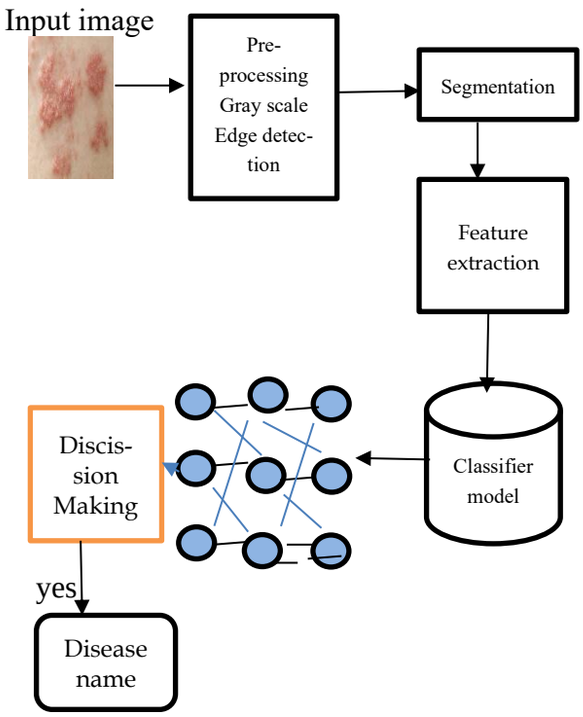

Figure 1: block diagram of proposed model

3.1 Preprocessing:

Overcoming a few significant challenges is necessary for the skin disease detection system to operate at a high level. For example, standardizing image dimensions and building a . The method for resizing images is defined in the next section. Preparing raw data to make it fit for creating and training machine learning models is known as data preprocessing, and it stands as a segment in the data mining and data analysis process. In this image. Preprocessing many techniques is used namely. i)Greyscale method: Images in grayscale, sometimes written as grayscale, are single-channel images in which each pixel is represented by a single intensity value, which in an 8-bit image usually ranges from 0 (black) to 255 (white). Grayscale images are frequently utilized in Convolutional Neural Networks (CNNs) for a change of computer vision tasks. ii) Canny edge detector method: In image processing, edge detection is a technique used to identify the boundaries of the objects in the image. A sharp shift in pixel intensity inside an image is called an edge. The border extrication of different regions or objects with different intensities is represented by edges. iii)Image resizing: An input image's size can be improved or decreased to fix the issue of disparate image sizes in the database. All photographs will have the same number of characteristics if the image sizes are unified. Resizing the image also improves system speed by cutting down on processing time. 260 x 325 pixels is the space of the original image.Performing image preprocessing is shown below

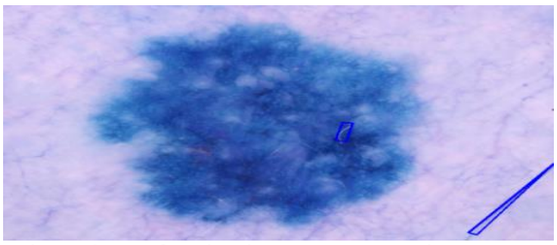

Figure 2: performing image preprocessing

3.2 Segmentation: In order to assist with object detection and related tasks, image segmentation is a computer vision approach that divides a digital image into distinct groupings of pixels, or image segments. Faster, more sophisticated image processing is made possible by image segmentation, which divides an image's complex visual data into precisely formed segments. In this system a common segmentation method for differentiating an object in the foreground from its background is thresholding. A threshold is a value that has two regions: one on the below side and one on the above side. Gray scale pictures are used to use this thresholding technique in computer vision. The segmentation is done is shown below

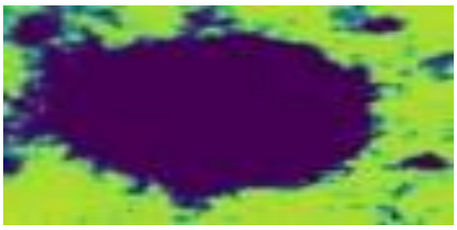

Figure 3: performing segmentation

3.3 Feature Extraction: Texture features are attributes of an image's texture that are used to characterize an image's visual texture in image processing and computer vision applications. Patterns or structures in a picture that are not captured by more conventional features like color or shape can be recognized using these features. This feature extraction is based on color,edging thickness etc In this we used is inception-v3.Texture features can be extracted from an image using a variety of techniques, including statistical techniques. Local binary patterns, Gabor filters, and co-occurrence matrices are a few instances of texture features. Numerous tasks, including object recognition, image segmentation, and classification, can be accomplished with these attributes.

3.4 Classification:

The process used is meticulously inspected for quality. The method involves using previously created image recognizers that have been altered to differentiate between skin-related photos. The measure verifies that the program is error-free and satisfies the requirements listed in the system prerequisites report. Arrangement is done by the CNN model. The entire experimental strategy that makes use of image processing and computer vision tools to detect skin diseases. In this situation, the system receives the skin image data for processing. Preprocessing, feature extraction, and machine learning-based classifiers are used to the input image to determine whether or not a skin illness is present and to provide medication recommendations made on the stage of the skin condition. Three steps are included in the machine learning phase: detection, training, and processing. Convolutional neural networks are supervised machine learning algorithms that are taught with labeled data working to different classes to specify picture recognition and classification. The residual connections and the inception module are combined in the ResNet-v2 architecture. This is an advancement over the Inception model, which offers superior multiclass classification accuracy. As a effect, we examined how these designs perform under various criteria using our dataset. When training the CNN architectures, we employed a fine-tuning approach in which we unfrozen the last dense layer and frozen the weights of all other layers.

Equation (1) is the mathematical equation of cnn model shown below

$$Y[I,j,k]=\max(m,n)€poolregion\ X[si+m,sj+n,k] \quad (1)$$

Where Y= is the input feature map, pool region is the pooling window, si, sj = stride indices.Stride = Using this image filter moves

4.Expereimental result :

In this case, the system receives the skin image data for processing. In this, an additional 200 images are collected from Kaggle and trained and tested images after that Pre-processing, feature extraction, and machine learning-based classifiers are used to input images to determine if a skin illness is present and to provide medication recommendations created on the stage of the skin condition. Three steps are included in the machine learning phase: detection, training, and processing. The result of the detection disease in fig 4

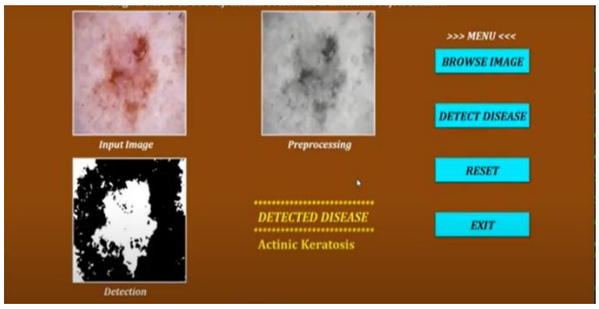

Figure 4: predicting disease and its name

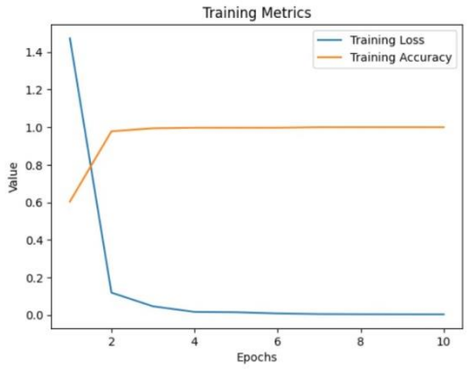

Figure 5: Accuracy of trained image

In this table 1 briefly explains about the comparative study of different paper and also their algorithms and also their accuracy is also mentioned due to this clear idea is obtained about the other accuracy vs our method. It shows the changed

No of observations	TP	FP	TN	FN	FP rate	FN Rate	Accu Racy	F1 score
50	40	5	31	2	0.06	0.025	0.95	0.9

Tabel 3: confusion metrics table

work and the first column represent the reference paper the second column represents the title of the study the third column represents the algorithm used the last column. Correctness of the work is mentioned in table 1

reference	Title	Algorithm used	Accuracy
[1]	Classification using cnn	CNN	80%
[4]	Deep learning approach to skin layer segmentation in inflammatory dermatomes	CNN	84%
[5]	Skin cancer detection using Convotional and Artificial Neural Network.		
[10]	"Skin disease detection using convolution nueural network	CNN	73%
Proposed Method	Detection of texture-based skin disease using CNN	CNN	93%

Tabel 1: Comparative analysis

Number of observations	Correctly recognized		Accuracy
50	40		93%

Table 2: Accuracy table

In the below table represents the accuracy represents how many images taken in that how many images correctly recognized and in the last represents accuracy of the proposed system in table 2
TP means true positive occurs when model predics positive class, FP means false positive when moel predicts incorrect class, TN occurs when model identify positive class, FN occurs when model predicts negative class, FP rate means truely positive rate average of falsely predicts images,
FN rate means false negative rate indicates that average of falsely identifies the image
F1 score means that overall model accuracy
Shown in table 3.

5. Conclusion

The suggested method, which combines computer vision and machine learning approaches, can diagnose the skin illness with promising results. It can be utilized for both productive work and helping individuals from all around the world. Since the user can access and utilize the tools for free, there is no expense associated with deploying the system. The created application is small and adaptable to machines with modest system requirements. In the proposed system we gave the image as the input type it detects the image and start preprocessing using gray scale and can-

ny edge detection method after that segmentation is done using thresholding technique, then feature extraction is done based on color, texture and thickness using inception v3 method then the last step is classification done by CNN model due to all these steps it will detect the disease and also detect the name of the disease. The proposed model gives 93% accuracy and gives more accuracy compared to other models in table 2. In the proposed system it will detect the disease based on texture it will helps to give more accuracy compared to only color and thickness of the skin features.

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