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Skin Disease Detection Using CNN

Sanjana S Ghatina[1] and Mr Santhosh S G[2]
PG Student, Department of Computer of Application[1]
Associate professor, Department of Computer of Application[2].
J N N College of Engineering, Shivamogga, India

Abstract: *Nowadays, skin conditions affect humans frequently; in fact, they affect people more frequently than other illnesses. Compared to other types of sickness, skin conditions are becoming increasingly common. Dermatology is the branch of biology that deals with identifying and treating conditions that primarily affect the skin. Skin conditions can be brought on by viruses, germs, allergies, and fungi, among other things. Typically, these illnesses cause hidden harm that lowers one's self-esteem and causes sadness. The advancement in medical technology has made it possible to diagnose the disease more quickly but the cost for this technique is more expensive. Because of its unevenness, tone, hairiness, and other mitigating factors, human skin is one of the most unexpected and difficult surfaces to mechanically synthesise and analyse. Consequently, there is a growing need for an automated system that can accurately diagnose skin diseases. In order to classify skin diseases into their main categories, such as melanocytic nevi, melanoma, benign keratosis-like lesions, basal cell carcinoma, actinic keratoses, vascular lesions, and dermatofibroma, a learning model was developed.*

Keywords: Skin disease, Python, Image processing, CNN

I. INTRODUCTION

The skin is the biggest organ in the human body. The most prevalent type of infection that affects people of all ages is skin disease. Skin illness affects more than simply the skin. It may significantly affect a person's daily life. The primary purpose of skin is to shield the body from hazardous elements from the environment. Because of numerous variations in the environment and geography, various diseases vary. Early diagnosis is crucial to control the growth and spread of skin disorders. Skin illness has thus become one of the most important problems in the area of medicine. Some skin conditions don't manifest symptoms for several months, which allow the illness to grow and spread.

The majority of regular people are unaware of the kind and stage of a skin illness. This is a result of the general public's inexperience about medicine. Skin disorders can now be identified much more rapidly and accurately because to improvements in laser and photonics-based medical technologies. However, the expense of such a diagnosis is still prohibitive and high. So, to diagnose skin illnesses, we suggest a method based on image processing. This technique uses image analysis to determine the type of disease by taking a digital photograph of the affected skin area. Our suggested strategy requires only a computer and is quick, easy and economical.

The total quality of life, including both physical and mental health, is also negatively impacted. Many of these skin anomalies can be lethal, especially if they are not treated right once. Human mentality frequently assumes that the majority of skin irregularities are inappropriate for that particular skin problem, making it much worse. In contrast to the current diagnosis process, which entails extensive laboratory tests, the proposed system will allow users to forecast skin diseases using Convolutional Neural Networks.

II. LITERATURE SURVEY

To identify the many types of skin diseases, several researchers have suggested image processing-based approaches. Here, we go over a few of the methods that have been documented in the literature.

In [1], a method for analyzing skin conditions using color photographs is suggested without the requirement for medical assistance. The system is composed of two stages, the first of which involves the detection of the infected skin using color image processing techniques, k-means clustering, and color gradient techniques to identify the diseased skin, and the second of which involves the classification of the disease type using artificial neural networks. Six different types of skin illnesses were used to test the system, with first stage accuracy averaging 95.99 percent and second stage accuracy averaging 94.016 percent.

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The first stage in the approach of [2] for detecting skin disorders is the extraction of picture features. The accuracy of the system is improved in this way by extracting more information from the image. The strategy was applied to nine different forms of skin problems by the author of [2] with up to 90% accuracy. If not detected and treated in its early stages, melanoma is a kind of skin cancer that can be fatal.

In [3], the author concentrated on the analysis of various segmentation methods that may be utilized to identify melanoma through image processing. The segmentation procedure that uses the boundaries of the diseased spot to extract more information is discussed.

The research of [4] suggested creating a tool for diagnosing melanoma in people with dark skin utilizing specific algorithm databases that also included photographs from other melanoma websites.

Similarly, [5] studied classification of skin illnesses using the technology support vector machine, including melanoma, basal cell carcinoma (BCC), nevus, and seborrheic keratosis (SK) (SVM). From a variety of other procedures, it produces the most accurate results. On the other side, the spread of persistent skin conditions in many areas may have negative outcomes.

As a result, [6] suggested a computer system that can quickly identify eczema and assess its severity. The method consists of three stages: effective segmentation by skin detection in the first, extraction of a collection of features, such as color, texture, and boundaries in the second, and use of support vector machines to gauge the severity of eczema in the third stage (SVM).

[7] proposes a novel method that uses computer vision and machine learning to identify skin disorders. While machine learning is used to identify skin problems, computer vision is used to extract features from images. Six different skin conditions were tested, and the system performed 95% accurately.

III. METHODOLOGY

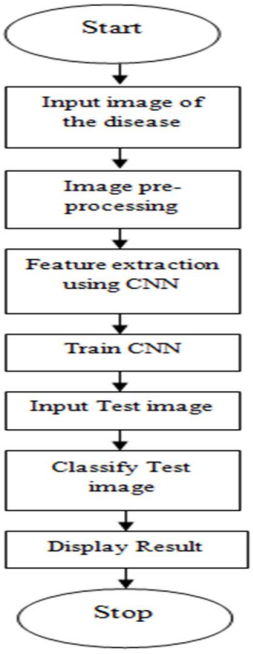

Fig.1: Functional Process chart

In this section describes the proposed system's methodology for image-based detection, extraction, and classification of skin disorders. This technique will be very useful for detecting melanoma, melanocytic nevi, benign keratosis-like lesions, basal cell cercinoma, actinic keratoses, vascular lesions, and dermatofibromas diseases. My project's goal is to use a neural network based on skin image input texture analysis to identify skin lesions. This technique uses a digital photograph of the affected skin area to identify the kind of disease through image analysis. It's suggested method is easy, quick, and doesn't call for pricey equipment. Then use a pre-trained Convolutional neural network to resize the image and extract features.

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The user is then presented the results, along with the disease type. The technology has a 100% accuracy rate for correctly identifying different types of skin disorders.

3.1 System Design

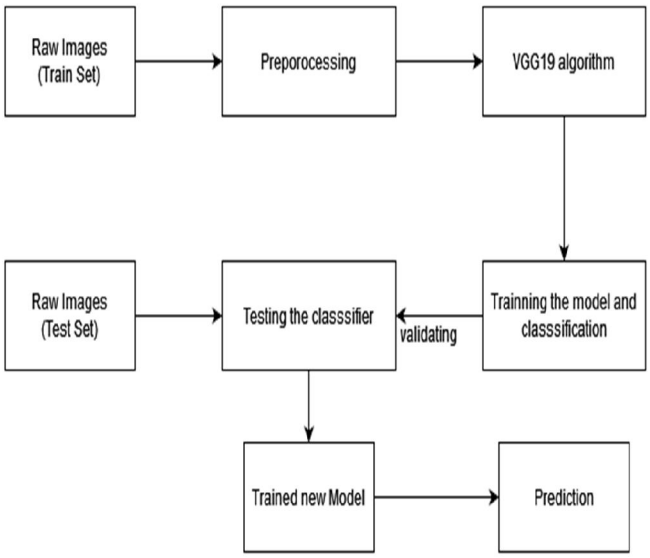

Fig. 2: Flowchart representation

According to the flowchart above, the system initially accepts a raw image as input and preprocesses it. In order to enhance the overall image while maintaining the image's edges, filtering is utilized as part of the pre-processing of images, removing any undesirable edges and resizing the image to the desired format. The VGG-19 algorithm, which utilizes the Convolutional Neural Network(CNN). A CNN is a type of deep neural network where the computer learns on its own, divides into the level of prediction, and produces accurate results in a very short amount of time. Before being sent to testing, the image is validated and categorized after being trained with a model. Finally, a disease prediction is made

3.2 Accuracy Line Graph

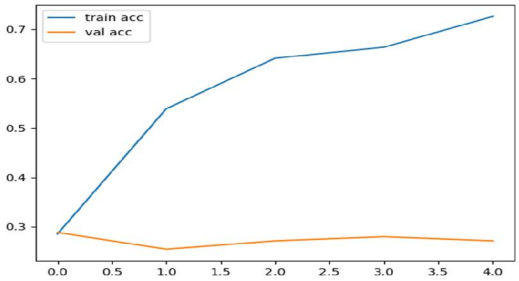

Fig. 3: Line graph of train v/s validation accuracy

Using training data, we train the model, and both training and validation sets are used to evaluate its performance. The accuracy rate of the instruction is 95 percent as opposed to the accuracy rate of 65 percent.

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A. Labeling

The dataset is labeled into 7 different categories:

Melanocytic Nevi

Fig. 4: Melanocytic Nevi

Also called: pigmented nevus

A condition that affects the pigment-producing skin cells that are typically known as moles or birthmarks. This sort of mole, which is frequently big, is brought on by a malfunction of the pigment producing melanocytes (melanin).Raised, flat, or rough melanocytic nevi are all possible. They could be present at birth or develop later. Melanocytic nevi can very rarely develop into malignancy. Most cases don't need to be treated, but in others, the mole needs to be removed.

Melanoma

Fig. 5: Melanoma disease

Also called: malignant melanoma.

The most serious kind of skin cancer. When the pigment producing cells that give the skin its color develop cancer, melanoma results. A new, peculiar growth or a change in an existing mole could be symptoms. Anywhere on the body can develop melanoma. Surgery, radiation, medicine, and occasionally chemotherapy are all possible forms of treatment.

Benign keratosis-like lesions

Fig 6: Benign keratosis

Also called: Seborrheic keratosis

A benign skin ailment that manifests as a waxy growth that is brown, black, or tan in colour. One of the most prevalent non-cancerous skin growths in elderly persons is a seborrhoeic keratosis. Although one can develop on its own, numerous growths are more typical. The face, chest, shoulders, or back are common areas for seborrheic keratosis to manifest. It seems waxy, scaly, and somewhat raised. There is no need for treatment. A doctor can remove seborrheic keratosis if it irritates the skin.

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Basal cell carcinoma

Fig 7: Basal cell carcinoma

Also called: BCC, basal cell cancer

As old skin cells die, basal cells regenerate new ones. Limiting sun exposure can aid in preventing the malignant transformation of these cells. On sun-exposed areas like the face and neck, this cancer generally manifests as a white, waxy lump or a brown, scaly patch. Prescription creams and cancer-removing surgery are available as treatments. Radiation therapy may be necessary in specific circumstances.

Actinic Keratosis

Fig 8: Actinic Keratosis

Also called: solar keratoses

a skin condition brought on by years of sun exposure that is rough and scaly. Older persons are typically affected by actinic keratoses. Keeping out of the sun can help lower danger. The face, lips, ears, forearms, scalp, and neck are the areas where it occurs most frequently. The rough, scaly skin area slowly becomes larger and typically exhibits no other symptoms. Years may pass before a lesion appears.

Vascular lesions

Fig 9: Vascular lesions

Vascular lesions, often known as birthmarks, are relatively common anomalies of the skin and underlying tissues. Hemangiomas, Vascular Malformations, and Pyogenic Granulomas are the three main classifications of vascular lesions.

Dermatofibroma

Fig 10: Dermatofibra

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A cutaneous condition that frequently develops, dermatofibroma is typically located in the dermis of the skin. The terms benign fibrous histiocytomas of the skin, superficial/cutaneous benign fibrous histiocytomas, and common fibrous histiocytoma are all used to describe dermatofibromas.

B. Training

To do this, we must separate the data into testing sets and training sets. Any ratio is acceptable for this division. Additionally, the number of time steps and batch size must be determined beforehand.

C. Model Building

Vgg-19 is what we've used. Convolutional Neural Networks (CNNs) are a subclass of deep neural networks in which the machine learn independently, separates the input data into prediction different stages, and generates accurate results in a little period of time. Most classification and detection processes employ the convolutional neural network, or ConvNet. The human visual system served as an inspiration for CNN. The entire architecture of the Convolutional Neural Network is designed to look like the human brain and function like the human brain.

D. Prediction

The input images to be tested are preprocessed and are compared with the model file. The input image is preprocessed under goes with VGG-19(Visual Geometry Group-19)algorithm, this algorithm contains 19 different level that same image undergoes 19 level to predict the disease and the image is trained, tested and classified finally the type of disease is predicted with the accuracy rate of 100%.

IV. MODEL ARCHITECTURE

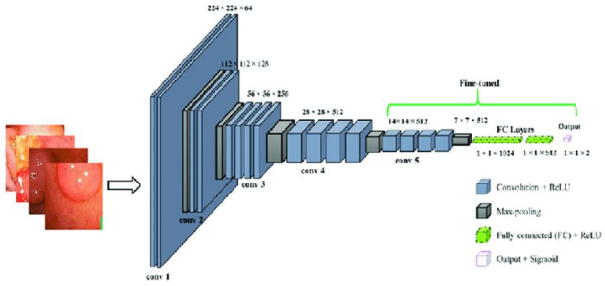

Fig. 11: VGG-19 Architecture

1. This network received a fixed-size (224 * 224) RGB image as input, indicating that the matrix was shaped (224, 224, 3).
2. The only preprocessing carried out was the computation of the mean RGB value for each pixel throughout the entire training set, and then it was subtracted from each pixel.
3. They covered the entirety of the image by using kernals that were (3 * 3) in size with a stired size of 1 pixel.
4. Max pooling was carried out with stride 2 over a (2 * 2) pixel window.
5. Rectified linear unit (ReLu) was used as a follow-up to introduce non-linearity and speed up computing by improving model classification.
6. Implemented three fully connected layers followed by the soft max.

V. RESULT

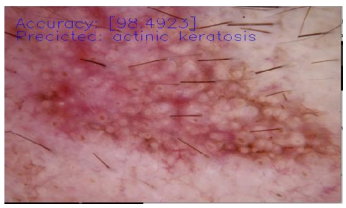

Fig. 12: Skin disease predicted-Actinic Keratosis

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VI. CONCLUSION

The prevention of disease transmission and development of skin diseases begin with the early,detection of skin conditi ons. Even though skin conditions are the fourth most common cause of sickness in people, many people still avoid consulting doctors. For the diagnosis of dermatological illnesses, we provided a reliable and automated method. When skin conditions are treated early on, they are less disfiguring and more successful. We should be clear that, in terms of replacing doctors, no machine can currently replace the human input on analysis and intuition. Skin disease diagnosis requires expensive and time-consuming clinical procedures. At first, automated dermatological screening systems are built with the use of image processing algorithms.

FUTURE WORK

There are other improvements and expansions that will be made in the future, but the first is that the way of detecting skin diseases must be on the built mobile application. In future system, the treatment for the disease can also be display to uses so that they can allow the remedies to reduce the disease.

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