JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Classification of Skin Diseases Using CNN and Image Processing

- **Ms. G. Manasa, (M.C.A). Rajeev Gandhi Memorial college Of Engineering and Technology, Nandyal**
- ***Mr. V. V. Nagendra Kumar, M. Tech, (Ph.D), Rajeev Gandhi Memorial college Of Engineering and Technology, Nandyal**

Abstract

The most common illnesses worldwide are those related to the skin. Despite being frequent, diagnosis is exceedingly challenging and necessitates substantial domain knowledge. We offer a method to identify distinct forms of these diseases in this research. We employed computer vision and machine learning as two separate steps to precisely detect illnesses. The project's goal is to identify the type of skin illness and provide the appropriate treatment quickly and accurately.

Before feature extraction, several pre-processing procedures are applied to the skin disease in the image. The second stage then entails analyzing and observing the skin to identify disorders using machine learning techniques. In rural locations, the proposed approach is quite helpful because Dermatologists are difficult to access.

We utilize a Python script built on PyCharm to gather data for the suggested system. As a result

of inherited traits and environmental variables, skin illnesses are the most prevalent worldwide. People frequently disregard the early effects of skin diseases. In the current approach, skin diseases are discovered through the biopsy process, which is then examined and treated manually by the doctors. We recommend a hybrid strategy combining computer vision and machine learning approaches to get beyond this manual scrutiny and deliver promising results quickly. Histopathological microscopic images would be the input images for this, and attributes like color, shape, and texture would be retrieved and supplied to convolutional categorization and illness identification using a neural network (CNN).

The project's goal is to identify the type of skin illness and offer the best, most comprehensive medical advice quickly and accurately. skin condition considerably faster and more precisely. However, the expense of such a diagnosis is still prohibitive and high. Therefore, image processing methods aid in the beginning development of an automated dermatology screening system.

The classification of skin diseases relies heavily on the extraction of features. In several methods, computer vision plays a part in the detection of skin conditions. Skin infections are prevalent in Saudi Arabia as a result of the deserts and the hot climate. This project advances the study of skin disease detection. Our suggestion was an image-based

Keyword: Ham10000, image processing, CNN, ResNet50, Xception, Skin Disease Classification.

1. INTRODUCTION

1.1 Introduction

More people have skin conditions than other illnesses. Skin conditions can be brought on by viruses, germs, allergies, fungal infections, and more. A skin condition can alter the skin's tone or texture. Skin conditions tend to be persistent, contagious, and occasionally carcinogenic. To prevent the onset and spread of skin diseases, early diagnosis is therefore necessary. A skin condition requires more time for diagnosis and treatment, and the patient incurs both financial and physical costs. The majority of regular people often are not aware of the type and stage of a skin illness.

Some skin conditions don't manifest symptoms for several months, which allows the illness to grow and spread. This is a result of the general public's ignorance about medicine. Sometimes, a dermatologist (a medical professional who specializes in skin conditions) may also have trouble diagnosing the skin condition and may need pricey laboratory testing to pinpoint the condition's kind and stage. The development of medical technology based on photonics and lasers has made it possible to identify skin illnesses considerably more rapidly and precisely. However, the expense of such a diagnosis is still prohibitive and high. As a result, we suggest using image processing to diagnose skin problems. This technique uses image analysis to determine the type of disease by taking a digital photograph of the affected skin area. Our suggested method is easy, quick, and doesn't call for expensive equipment. aside from a computer and a camera.

The largest organ in the human body, the skin is made up of the epidermis, dermis, and subcutaneous tissues. It has blood vessels, lymphatic vessels, nerves, and muscles that may perspire, sense the outside temperature, and protect the body. The skin, which covers the entire body, may defend several human structures and organs against intrusions from the outside, including artificial skin damage, chemical damage, accidental viruses, and people's immune systems. Additionally, skin can stabilize the function of the skin barrier by preventing the loss of lipids and water from the epidermis and dermis.

Skin is not indestructible since it is constantly altered by a range of external and hereditary variables, despite its defensive and barrier functions. Right now, there are There are three primary categories of skin conditions that affect humans: fungal, viral, and allergic skin conditions. Despite the fact that certain skin conditions are currently curable, people nonetheless experience difficulties as a result of these illnesses. Nowadays, the bulk of conclusions about the patients' current symptoms are formed mostly based on the doctors' own subjective assessments or their years of expertise, which might result in misinterpretations and postpone the treatment of these.

Therefore, learning how to extract signs of various skin disorders based on contemporary research and technology is of tremendous theoretical significance and practical benefit. This situation allows for the efficient and accurate detection of the various skin diseases.treat patients in accordance with their symptoms The image processing approach has advanced quickly in medicine over the last few years. Magnetic resonance imaging (MRI), digital subtraction angiography (DSA), and computed tomography (CT) are a few examples of equipment with a wide range of applications in people's daily lives. Scholars from all across the world have conducted deeper research in this area.

For instance, Oyola and Arroyo were able to identify the skin condition varicella by using image processing techniques such as color modification, equalization, and edge detection. The image of varicella was then gathered and categorised using the Hough transform.

Final empirical findings showed that a more accurate diagnosis of varicella was made, and a preliminary test was also based on research on varicella and herpes zoster. In their method for detecting skin lesions using partial differential equations (PDE), Chung and Sapiro developed a contour model of the lesions based on the PDE's morphological filtering.

2. Literature Survey

• **[1] Yasir, R., Rahman, M. A., & Ahmed, N**., One of the most prevalent health issues worldwide is skin disease. In this paper, we suggested a way for identifying various types of dermatological skin illnesses using computer vision-based methodologies. For feature extraction and feed-forward artificial neural network training and testing, we have used a variety of image processing algorithms.

The system has two stages to its operation: first, it pre-processes color skin photos to extract key traits, and then it detects diseases. 90% accuracy is achieved in the system's ability to accurately identify nine different forms of dermatological skin disorders. Dermatology is the area of medicine that deals with illnesses of the skin, hair, and nails.

It is a specialization having elements of both medicine and surgery. Diseases are treated by a dermatologist in

the In the broadest sense, a dermatologist treats diseases as well as some cosmetic issues with the skin, scalp, hair, and nails. Due to its intricacy of jaggedness, tone, hairiness, and other mitigating factors, human skin is one of the most unpredictable and challenging terrains to automatically synthesize and analyze. Many people find it pricey to visit a dermatologist for their skin disease issue in a poor nation like Bangladesh.

Many people in underdeveloped nations like Bangladesh experience a great deal of suffering each year as a result of various skin conditions. Therefore, having an automated skin disease diagnosis system is crucial, especially in poor nations, for both patients and dermatologists. Despite the fact that there have been many There have been studies done to use computer vision-based algorithms to diagnose dermatological skin illnesses, however almost none of them were successful for more than two or three diseases. We have focused our efforts on identifying nine different skin disorders. They are Tinea Corporis, Pityriasis Rosea, Leprosy, Psoriasis, Scabies, Foot Ulcer, and Eczema. For image preprocessing, we employed 8 distinct types of algorithms (YCbCr, grey image, sharpening filter, median filter, smooth filter, binary mask, histogram, and Sobel operator).

Summary: an automated system for identifying different skin conditions. Since human skin is one of the most challenging surfaces to analyze, at first it was challenging for us to analyze its properties. Due to the fact that our dataset was created after months of labor in a real Bangladeshi hospital rather than through secondary sources, it is both distinctive and fresh from the standpoint of Bangladesh. 90% of the time, the technology accurately detects the disease by examining an image of affected human skin. A total of 775 skin pictures have been examined for nine different illnesses.

3. OVERVIEW OF THESYSTEM

3.1 Existing System

This model highlights an existing technique that was created utilizing some deep learning techniques. Here, the process is carried out utilizing ANN methods, one of the machine learning techniques, but the accuracy was not very high.

3.1.1 Disadvantages of Existing System

- Less feature compatibility
- Low accuracy
- Large Data Requirements
- Data Imbalance
- Limited Interpretability
- Model Robustness.

3.2 Proposed System

The classification of either Skin Disease identification or Convolution Neural Network (CNN) of deep learning together with the transfer learning techniques is done utilizing the purposed method. as image analysis-based methods for classifying skin diseases. Therefore, accurate classification is crucial for the right nutrition that would be made possible by applying the strategy we have suggested. Below is a block schematic of the suggested method. Deploy the trained and validated model in a user-friendly interface, allowing dermatologists and healthcare providers to upload skin lesion images for classification. Regularly update and refine the model by incorporating new data and incorporating feedback from medical professionals to enhance its accuracy and performance.

By following this proposed system, a CNN-based skin disease classification model can be developed and deployed, assisting medical professionals in accurately diagnosing skin conditions and providing timely treatment recommendations. Regular updates and continual improvement will help the model stay relevant and effective in real-world medical scenarios.

3.3 Methodology

Classifying skin diseases using Convolutional Neural Networks (CNNs) and image processing is a popular and effective approach in the field of computer vision and medical image analysis. Below is a step-by-step methodology for classifying skin diseases using CNN and image processing:

In this project work, I used five modules and each module has own functions, such as:

1. System Module
2. User Module

3.3.1 Dataset Collection:

The dataset containing images of the Skin disease classification images with the Classification i.e., normal are

to be classified is split into training and testing dataset with the test size of 30-20%.

3.3.2 Preprocessing

Resizing and reshaping the images into appropriate format to train our model. Apply data augmentation techniques to increase the diversity of the training dataset. Techniques like rotation, flipping, zooming, and brightness adjustments can be helpful to improve model generalization.

3.3.3 Training:

Use the pre-processed training dataset is used to train our model using CNN Deep learning along with Resnet50 transfer learning methods. Use the validation set to monitor the model's performance during training and perform early stopping if needed to avoid overfitting.

3.3.4 Classification

The results of our model are display of Skin disease classification images are either with different labels.

3.3.5 User Module

Upload Image

The user has to upload an image which needs to be classified. upload skin lesion images and receive predictions.

View Results

The classified image results are viewed by user. Indicating the most probable skin disease and its associated probability score.

4 Architecture

The system architecture diagram is a visual representation of the software architecture. It depicts the system architecture, including its context, components, relationships, and dependencies. The key to a good system architecture is to clearly communicate its requirements to your stakeholders and developers, and to have a well-defined system architecture from the beginning. the general system representation shows the major functions of the system and the relationships between the various system components. Above architecture diagram shows three stages of data flow form one module to another module. Data collection, preprocessing, and algorithm training.

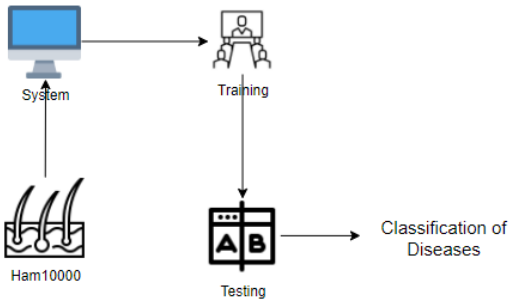


Fig 1: Frame work of proposed method

5 RESULTS SCREEN SHOTS

Home Page:

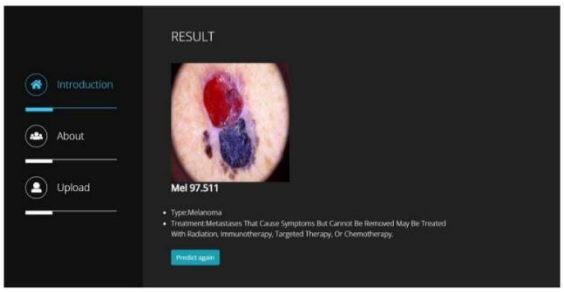
Upload image:

Snap shot 3: Upload image

Choose options:

Snap shot 2: About the Skin Disease Dection

Predict Result:



Snap shot 4: Result of image

7. CONCLUSION

✓ With the help of deep learning and transfer learning, we were able to successfully classify the photos of skin diseases in this research. Here, we have considered the dataset of ham10000 pictures, which will be trained using CNN as well as certain ResNet50 transfer learning techniques. Following the training, we tested the system by submitting an image and categorizing it.

- ✓ In this project, the proposed DCNN model achieves a better classification rate when compared to other transfer learning models. The ability of the proposed method is to classify benign and malignant skin lesions by replacing the output activation layer with sigmoid for the binary classification.

Future Enhancement

- ✓ This can be used in the future to categorize various disease kinds and alert patients to potential risks in future, we will work on a large dataset with more labelled skin lesions with building up a successful DNN including pre-processing steps to gain the best prediction and classification accuracy.
- ✓ Skin cancer can also be diagnosed with the CAD which is user-friendly and robust for any conditions of acquired images. So, we will also try to make a DNN which may detect various types of skin lesions using CAD systems.

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