

Skin Diseases Detection and Classification using Deep Learning Algorithm Convolutional Neural Network

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1. ABSTRACT

Skin is the most powerful protection of important organs in the human body. It acts as a shield to protect our internal body to get damaged. But this important part of the human body can be affected by so serious infections caused by some fungus or viruses or even dust too. Around the world, millions of people suffer from various skin diseases. From acne problems to eczema people suffer a lot. Sometimes a small boil on the skin can turn into a severe issue or even an infection that will cause a major health issue. Some skin issues are so contagious that one can be affected by another just with a handshake or using a handkerchief.

A proper diagnosis can result in proper medication that can reduce the miseries of the people suffering create awareness. In this research, we have tried to develop a prototype to detect skin diseases using neural networks. In the choice of neural networks, we have chosen CNN which abbreviates as a convolutional neural network. Earlier detection works have been done using DNN which is a deep neural network. Right now have classes to identify a typical skin malady called dermatitis hand, eczema hand, eczema sub cute, lichen simplex, states dermatitis and ulcers. This project is a sandwich between picture handling strategies and machine learning. Where picture preparation has produced the picture which is being utilized by CNN to arrange the classes.

The proposed method is superior in terms of diagnostic accuracy compared to the methodologies that are currently considered state of the art. The performance of the provided architecture is evaluated based on its sensitivity, accuracy, and specificity.

KEYWORDS- Skin Disease, CNN, Machine Learning Classification.

2. INTRODUCTION

Skin is a part of our body that is not separable. It protects our kidney, heart, liver, and other sensitive organs from the outside environment. This part of the body is a shield that needs to be protected to ensure a healthy lifestyle. Skin produces various vitamins the vital one is vitamin-D. If this part of our skin gets infected then that became the worst.

Around the world, we have various types of weather, environment different type of weather conditions, humidity, food habit they can directly or indirectly affect our skin. To solve any problem that could be mathematical, science, economics we need to detect the problem first. To treat our skin first we need to identify the disease first. Skin can be affected by fungus and cause different kinds of fungal infections. Suffering from skin issues is common in our day to day life as we have to spend a long time outside under the sun or into the pollution that causes sweat which is a house of bacteria that creates bad smell along with some skin problems. Maintaining proper hygiene is a punch in the face of the skin issue. But some issues turn out to be vital that need proper identification with medication.

The identification tool is our production. Visual imaginary classification is done with We have topped CNN over image processing to introduce a development in the field of medicine which we have named Derm-NN. It is an application of a convolutional neural network to detect skin disease. In this research, we have made a classifier prototype that will give the class of skin disease by analyzing an image and matching the image from its previous training data to produce maximum accuracy. In this test, we have used the dement dataset some images are collected from the internet randomly.

Our classifier can accurately classify 70% of skin diseases. We have specified five classes of skin disease. We have used a part of our dataset for the training phase and also for the testing phase. The disease is an odd state of body where the natural functionalities of the body get to be stopped due to some imbalance on the body organs. Eczema is a skin condition where the skin became irritated due to the attack of some bacteria that inflame the skin and cause redness, itchinness some blisters too .

The convolutional neural network has proven its niche in the sector of computer vision and machine learning. It belongs to a class of neural networks. It has a great hold on the field of image it. In this paper, we have created a classifier that will take input of an image that contains the contaminated skin image with its prior knowledge or could be referred to as the training data the classifier will determine its class. All the class information their accuracy and result analysis have been given in the other parts of the paper. Skin disease has not been astounding until now. We motivate to do this study to create the cognizance about the issue.

3. LITERATURE SURVEY

Author; s. paris, “a gentle introduction to bilateral filtering and its applications,”inacmsiggraph2007courses,2007,pp.

This course reviews the wealth of work related to bilateral filtering. The bilateral filter is ubiquitous in computational photography applications. It is increasingly common in computer graphics research papers but no single reference summarizes its properties and applications. This course provides a graphical, intuitive introduction to bilateral filtering, and a practical guide for image editing, tone-mapping, video processing and more.

4. PROPOSED SYSTEM

Image Processing is a system that can be partitioned into various classes: one of these is image compression another picture upgrade and the latter is the reclamation and measurement extraction. It assists with diminishing the measure of memory which is expected to store an advanced picture .The picture can be absconded. By the digitization process and by shortcomings, the pictures can be abandoned. An abandoned picture can be remedied utilizing Image Enhancement methods. And afterward, by testing and approving information, we have one an informational collection assortment, information resizes, information planning, expansion lastly applied the preparation strategy of this model. In this research, we have used the image processing feature accompanied with our own developed CNN architecture.

The architecture is given later below in the sections. We have computed the confusion matrix for the given 500 pictures from which we have denoted the training and testing data. The precision and recall have been calculated from the true positive, true negative, false positive and false negative values. The total value of the F1 score has been also determined. We have collected the images of certain skin diseases test and train the data. The dataset is independent. We have used different data for the training testing phase. Our two confusion matrix shows the result of the precision-recall values is absolute. The F1 score is also specified in the performance evaluation section.

5. CONVOLUTIONAL NEURAL NETWORK

Convolutional Neural Network are designed to process data through multiple layers of arrays. This type of neural networks is used in application like image recognition of face recognition. The primary difference between CNN and other ordinary neural network is that CNN takes input as a two dimensional array and operates directly on the images rather than focusing on feature extraction which other neural network focus on.

The dominant approach of CNN includes solutions for problems of recognition. Top companies like google and facebook have invested in research and developments towards recognition projects to get activites done with greater speed.

A convolutional neural network uses three basic ideas:

Local respective fields.

Convolution

Pooling

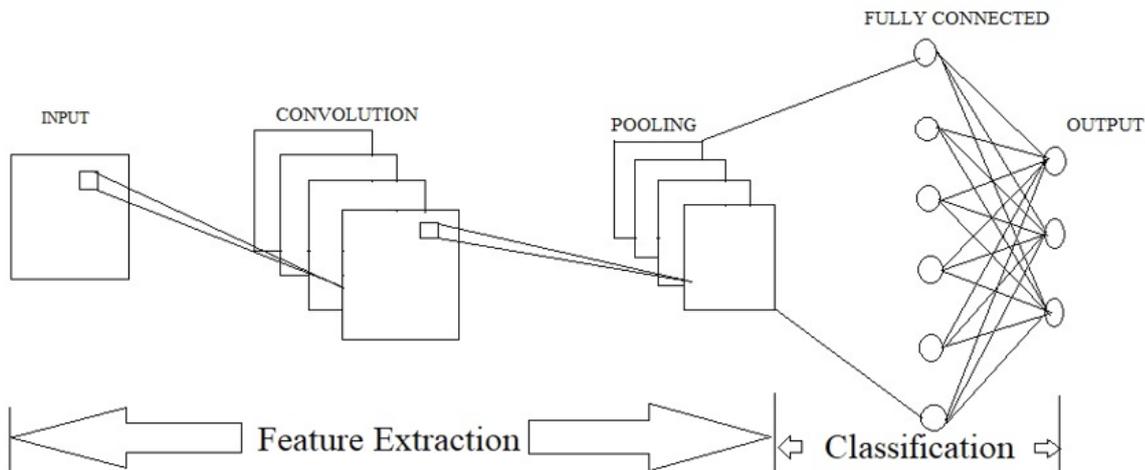


Fig: The Architecture of CNN

Artificial Dermatologist

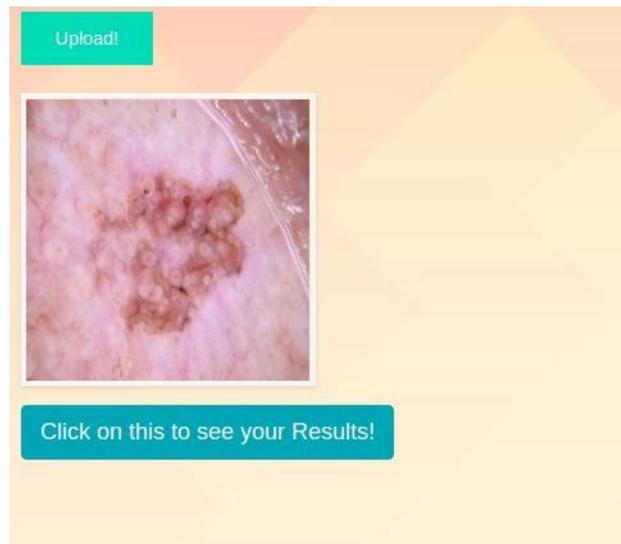
Skin is the largest and fastest growing organ of the body. In this contemporary world, skin diseases are mostly found in humans. A skin disease is a particular kind of illness caused by bacteria or an infection. These diseases like psoriasis have various dangerous effects on the skin and keep on spreading over time. It becomes important to identify these diseases at their initial stage to control it from spreading. Since there are large number of different skin diseases, manually identifying them can be a difficult task. Derma disease detection and classification can help in early identification of disease, prevent it from becoming chronic. We are collect 5 images it contains img1-actinic keratosis, img2-dermatofibroma, img3-melanoma, img4- seborrheic keratosis, img5-squamous cell carcinoma.

The following Derma Diseases are identified by our virtual doctor:

- Actinic Keratosis
- Dermatofibroma
- Melanoma
- Seborrheic Keratosis
- Squamous Cell Carcinoma

6. RESULT ANALYSIS

Upload an image using upload button



Click for results



In this section, there is a discussion on Machine Learning performance of a Novel Approach is used for Skin Diseases Detection and Classification using Deep Learning Algorithm Convolutional Neural Network, to Optimize Prediction Method. The performance metrics like Accuracy, Recall and F1 score are measured, based on these values. By the terms, these factors of classification measurement are calculated.

True Positive: If a sample is predicted correctly as positive and in actual it is positive.

True Negative: If a sample is predicted correctly as negative and in actual it is negative.

False positive: If a sample is incorrectly predicted as negative but in actual it is positive.

False Negative: If a sample is predicted incorrectly as positive but in actual it is positive.

Accuracy: It measures the ability of the system to make correct predictions, it is a performance parameter, and is expressed as,

$$Accuracy = \frac{TP}{TP + TN + FP + FN} \quad (1)$$

Recall: To the total number of observations in actual class, it is the ratio of correctly predicted positive observations. and is expressed as,

$$Recall = \frac{TP}{TP + FN} \dots (2)$$

F1-Score:

A weighted average of the precision and recall, is consider as F1-Score.

$$F1 \text{ score} = \frac{2 * TP}{2 * TP + FP + FN} \dots (3)$$

Classifier	Precision	Recall	F1-Score	Accuracy
DT	71.00	69.05	59.10	67.10
RF	71.05	71.05	65.10	71.00
GBT	68.20	73.05	70.10	73.45
CNN	91.10	87.69	89.35	88.84

Fig: Proposed Classification Model

7. CONCLUSION:

The computerized skin ailment pictures were caught by the camera and preparing strategies were applied to these information pictures. Picture handling is a strategy that can be partitioned into various classes: one of these is Image Compression another picture upgrade and the latter is the reclamation, and estimation extraction. We trust that this model will be created as a genuine application for our clinical science for the government assistance of patients. It will be so encouraging for created nations to identify their sicknesses so they can concern prior and can make legitimate strides for their sound skin.

The strategy that has been suggested is based on CNN, and it is possible to think of it as an effective method of multiclass categorization. In terms of melanoma classification accuracy, the modular and hierarchical structure of our CNN classifier not only beats state-of-the-art machine learning techniques, but it significantly minimizes the amount of computational effort that is required. The fact that this strategy is only tested on a single dataset is one of the method's drawbacks

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