Journal of Engineering Sciences

Vol 13, Issue 06, June/2022
ISSN NO:0377-9254

# SKIN DISEASE IDENTIFICATION USING IMAGE ANALYSIS

Mr.Vadakattu Prabhakar, Assistant Professor,MTech,Department of CSE,prabhakarv@sreenidhi.edu.in

Palerla Prashanth Kumar,BTech, Department of CSE,18311a05g0@sreenidhi.edu.in

Rajavarapu Venkat Sai Kumar,BTech, Department of CSE, 18311a05g2@sreenidhi.edu.in

Gurijala Vishwanath, BTech, Department of CSE, 18311a05j0@sreenidhi.edu.in

**ABSTRACT:** Now a day's people are suffering from skin diseases, more than 125 million people are suffering from Psoriasis, also skin cancer rate is rapidly increasing over last few decades, especially Melanoma is most diversifying skin cancer. If skin diseases are not treated at earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images is deified, so that it is challenging job to devise an efficient and robust algorithm for automatic detection of the skin disease and its severity. Skin tone and skin color plays an important role in skin disease detection. To overcome the above problem we are building a model which is used for the prevention and early detection of skin cancer and psoriasis. An application is built where a person can upload an image from UI, then image will be sent the trained model. The model analyses the image and detect the skin disease that person had. Our system will use a Convolution neural network to train the images of skin diseases.

**Keywords:** *Detection of Skin diseases, convolution neural networks, deep learning, images. Domain: Deep Learning.*

## 1. INTRODUCTION

Skin diseases are more common than other diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. The advancement of lasers and Photonics based medical technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still limited and very expensive. So, image processing techniques help to build automated screening system for dermatology at an initial stage. The extraction of features plays a key role in helping to classify skin diseases. Computer vision has a role in the detection of skin diseases in a variety of techniques.


Fig.1: Skin disease segmentation

To overcome the above problem, we are building a model which is used for the prevention and early detection of skin disease. An application is built where a person can upload an image from UI, then image will be sent to the trained model. The model analyses the image and detect the skin disease that person had. Our proposed approach is simple, fast and does not require expensive equipment other than a camera and computer. The approach works on the inputs of a color image. Our system can successfully detect 7 different skin diseases with an accuracy of 98%. Our system will use a Convolution neural network to train the images of skin diseases. CNNs display a high performance as state-of-the-art skin lesion classifier. Unfortunately, it is difficult to compare different classification methods because some approaches use nonpublic datasets for training and/or testing, thereby making reproducibility difficult. Future publications should use publicly available benchmarks and fully disclose methods used for training to allow comparabilityIn general, most of the common people do not know the type and stage of a skin disease. Some of the skin diseases show symptoms several months later, causing the disease to develop and grow further. This is due to the lack of medical knowledge in the public. Sometimes, a dermatologist (skin specialist doctor) may also find it difficult to diagnose the skin disease and may require expensive laboratory tests to correctly identify the type and stage of the skin disease. The advancement of lasers and photonics based medical technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still limited and very expensive. Therefore, we propose an image processing-based approach to diagnose the skin diseases. This method takes the digital image of disease effect skin area then use image analysis to identify the type of disease. Our proposed approach is simple, fast and does not require expensive equipment's other than a camera and a computer.

## 2. LITERATURE REVIEW

### 2.1 A logical calculus of the ideas immanent in nervousactivity:

Because of the "all-or-none" character of nervous activity, neural events and the relations among them can be treated by means of propositional logic. It is found that the behavior of every net can be described in these terms, with the addition of more complicated logical means for nets containing circles; and that for any logical expression satisfying certain conditions, one can find a net behaving in the fashion it describes. It is shown that many particular choices among possible neurophysiological assumptions are equivalent, in the sense that for every net behaving under one assumption, there exists another net which behaves under the other and gives the same results, although perhaps not in the same time. Various applications of the calculus are discussed.

### 2.2 Feature extraction and image processing for computervision.

This book is an essential guide to the implementation of image processing and computer vision techniques, with tutorial introductions and sample code in Matlab. Algorithms are presented and fully explained to enable complete understanding of the methods and techniques demonstrated. As one reviewer noted, "The main strength of the proposed book is the exemplar code of the algorithms." Fully updated with the latest developments in feature extraction, including expanded tutorials and new techniques, this new edition contains extensive new material on Haar

wavelets, Viola-Jones, bilateral filtering, SURF, PCA-SIFT, moving object detection and tracking, development of symmetry operators, LBP texture analysis, Adaboost, and a new appendix on color models. Coverage of distance measures, feature detectors, wavelets, level sets and texture tutorials has been extended. * Essential reading for engineers and students working in this cutting edge field * Ideal module text and background reference for courses in image processing and computer vision * The only currently-available text to concentrate on feature extraction with working implementation and worked through derivation.

**2.3 utomated Skin Disease Identification using Deep Learning Algorithm**

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. The system uses three publicly available image recognition architectures namely InceptionV3, InceptionResnetV2, MobileNet with modifications for skin disease application and successfully predicts the skin disease based on maximum voting from the three networks. These models are pretrained to recognize images upto 1000 classes like panda, parrot etc. The architectures are published by image recognition giants for public usage for various applications. The system consists of three phases- The feature extraction phase, the training phase and the testing / validation phase. The system makes use of deep learning technology to train itself with the various skin images. The main objective of this system is to achieve maximum accuracy of skin disease prediction.

**2.4 Vision-Based Skin Disease Identification Using Deep Learning**

Skin disease is the most common health problems worldwide.Human skin is one of the difficult areas topredict. The difficulty is due to rough areas, irregular skin tones, various factors like burns, moles. We have to identify the diseases excluding these factors.In a developing country like India, it is expensive for a large number of people to go to the dermatologist for their skin disease problem.Every year a large number of population in developing countries like India suffer due to different types of skin diseases. So the need for automatic skin disease prediction is increasing for the patients and as well as the dermatologist. In this paper, a method is proposed that uses computer vision-based techniques to detectvariouskinds of dermatological skin diseases. Inception_v3, Mobilenet, Resnetare three deep learning algorithms used for feature extraction in a medical image and machine learning algorithm namely Logistic Regression is used for training and testing the medical images.Using the combined architecture of the three convolutional neural networks considerable efficiency can be achieved.

**2.5 A Smartphone-Based Skin Disease Classification Using MobileNet CNN**

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 because of the unequal number of images on its classes. Using different sampling method and preprocessing of input data was explored to further improved the accuracy of the MobileNet. Using under-sampling method and the default preprocessing of input data achieved an

84.28% accuracy. While, using imbalanced dataset and default preprocessing of input data achieved a 93.6% accuracy. Then, researchers explored oversampling the dataset and the model attained a 91.8% accuracy. Lastly, by using oversampling technique and data augmentation on preprocessing the input data provide a 94.4% accuracy and this model was deployed on the developed Android application.

## 3. IMPLEMENTATION

Now a day's people are suffering from skin diseases, more than 125million people suffering from Melanoma and many more skin diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. If skin diseases are not treated at earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. Skin diseases can be prevented by investigating the infected region at an early stage. The advancement of lasers and Photonics based medical technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still limited and very expensive. Skin tone and skin color plays an important role in skin disease detection. One more problem with skin disease is the difficulty in recognizing the main cause. This difficulty occurs because the symptoms of different diseases are quite similar with each other.

To overcome the above problem, we are building a model which is used for the prevention and early detection of skin disease. An application is built where a person can upload an image from UI, then image will be sent to the trained model. The model analyses the image and detect the skin disease that person had. Our proposed approach is simple, fast and does not require expensive equipment other than a camera and computer. The approach works on the inputs of a color image. Our system can successfully detect 7 different skin diseases with an accuracy of 98%. Our system will use a Convolution neural network to train the images of skin diseases.

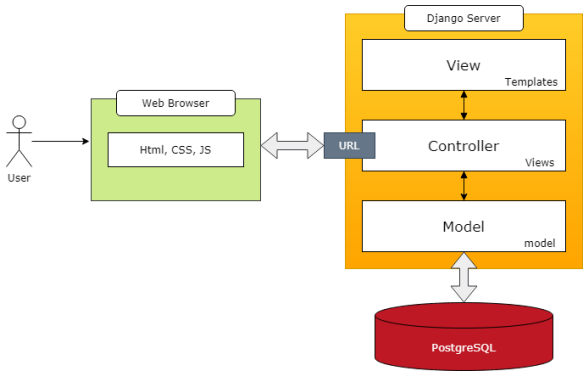


Fig.2: System model

## 4. METHODOLOGY

Dataset used in this manuscript was downloaded from the ISIC 2017: Skin Lesion Analysis Towards Melanoma Detection challenge website. This challenge provides a set of 2,000 publicly available thermoscopic images to participants. The data set also includes validation set with 150 images and test set with 600 images, shows dataset statistics and shows sample images from the dataset.

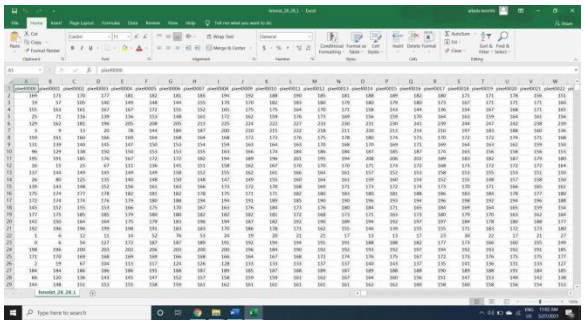

Fig.3: Dataset of skin diseases

Preprocessing data is among the most important phases in data science project, the idea is use a systemically approach to prepare data before feeding data into machine learning models. Segmentation is a popular preprocessing approach when the analysis and to detect objects and objects boundaries in digital images. In this work, Dataset images are RGB format (Red, Green, Blue) and since RGB images are more linked with the amount of light and illumination; it make it difficult to extract image features and boundaries, therefore, all images have been converted into HSV color space (Hue, Saturation, Value) which are more useful and relevant for objects detections in digital images. The second phase in dataset preprocessing is to apply Bilateral filter to all images, to keep sharp edges in the image because Bilateral filter substitutes the intensity of each pixel with a weighted average of intensity values from neighboring pixels. The third step is to convert images into grayscale images to reduce the complexity and dimension of images then automatically detect edges of the objects in an image using Canny edge detection method. Final step of preprocessing is to create a mask for each image and then apply Bitwise method to extract the desired object in image.

**Convolution Neural Networks (CNN):**

Convolution Neural Networks or covets are neural networks that share their parameters

Types of layers:

1. Input Layer

2. Convolution Layer

3. Activation Function Layer

4. Pool Layer

5. Fully-Connected Layer Block Diagram

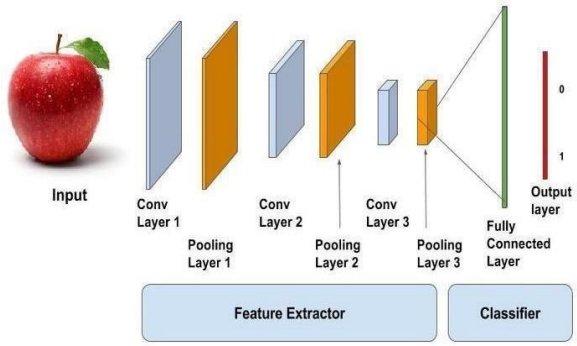


Fig.4: CNN model

**Support Vector Machine (SVM):**

Support Vector Machine" (SVM) is a supervised machine learning algorithm that can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is a number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

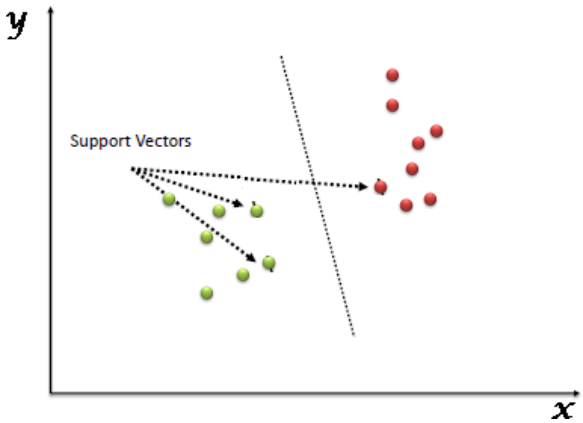


Fig.5: SVM model

**K-Nearest Neighbor (KNN):**

K-Nearest Neighbor is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using KNN algorithm. K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems. K-NN is a non-parametric algorithm, which means it does not make any assumption on underlying data. It is also called a lazy learner algorithm because it does not learn from the training set immediately it stores the dataset and at the time of classification, it performs an action on the dataset. KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data.

Example: Suppose, we have an image of a creature that looks similar to cat and dog, but we want to know either it is a cat or dog. So for this identification, we can use the KNN algorithm, as it works on a similarity measure. Our KNN model will find the similar features of the new data set to the cats and dogs images and based on the most similar features it will put it in either cat or dog category.


Fig.6: KNN classifier

## 5. EXPERIMENTAL RESULTS

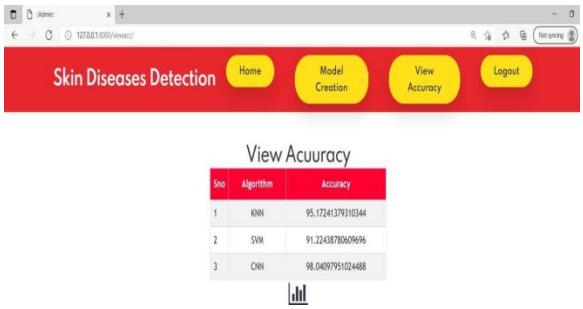


Fig.7: Output-1


Fig.8: Output-2

Fig.9: Output-3

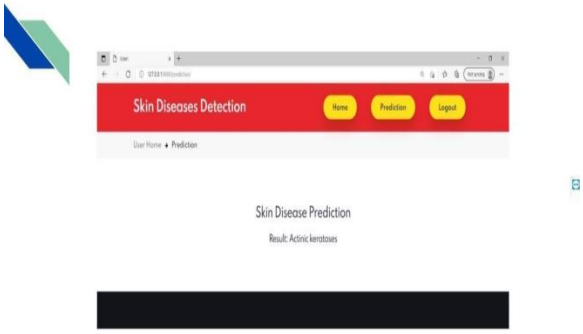


Fig.10: Output-4

## 6. CONCLUSION

A computational method based on deep learning (Convolutional Neural Network) was implemented, which utilized 2000 images provided by ISIC (International Skin Imaging Collaboration). The proposed method includes images preprocessing for extracting the region of interest in the image itself, and then augmenting some images to produce a bigger dataset which contains 3000 images for each class. The resulting dataset have been applied into CNN model to train the model, which comprise several layers such as convolution layers, pooling layers, and fully connected layers. Testing the model produced promising results with accuracy of 0.98. The result encourages and motivate for future improvement and research for online diagnosing of melanoma in early stages before it is too late. Future work of current research is to investigate and restructure the CNN architecture to increase accuracy, obtain more images data for training, apply new augmentation algorithms to train the model using more data, and the ultimate future plan is to make this model accessible and useable using smart phones applications.

## REFERENCES

[1] American Cancer Society (2019), Cancer Facts & Figures 2019.

[2] Dunphy, L. M., Winland-Brown, J., Porter, B., & Thomas, D. (2015). Primary care: Art andscience of advanced practice nursing. FA Davis.

[3] Géron, A. (2017). Hands-on machine learning with Scikit-Learn and TensorFlow: concepts, tools, and techniques to build intelligent systems. " O'Reilly Media, Inc.".

[4] McCulloch, W. S., & Pitts, W. (1943). A logical calculus of the ideas immanent in nervousactivity. The bulletin of mathematical biophysics, 5(4), 115-133.

[5] Nixon, M., & Aguado, A. S. (2012). Feature extraction and image processing for computervision. Academic Press.

[6] National Cancer Institute (2013), Skin Cancer Treatment Health Professional Version, Retrieved2019 from https://www.cancer.gov/types/skin/hp/skin-treatmentpdq

[7] Raschka, S. (2015). Python machine learning. Packt Publishing Ltd.

[8] Siegel, R. L., Miller, K. D., & Jemal, A. (2019). Cancer statistics 2019. CA: a cancer journal forclinicians, 69(1), 7-34.

[9] Zhou, S. K., Greenspan, H., & Shen, D. (Eds.). (2017). Deep learning for medical imageanalysis. Academic Press.