IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

ResNet based Deep Learning model for Skin Diseases Classification

Dr. M. Umamaheswari[1], Yogananda Arisetty[2], Shobhana Joshi[3], Pavani Bajjuri[4]
Associate professor, Department of Information Technology[1,2]
Assistant Professor, Department of Information Technology[3,4]
Malla Reddy College of Engineering and Technology, Hyderabad, India
umadeena@gmail.com[1]

Abstract: *Skin disease are commonest than other diseases. It might be caused by bacteria, parasites and viruses etc. The Advanced medical technology has made it possible to identify the skin disease faster and accurate. However, the cost of such skin diseases remains limited and expensive. So image processing techniques aid in the development of an automated screening system for dermatology at an early stage. The features extraction plays vital role in the classification of skin diseases. Computer vision has a function in the detection of pores and skin illnesses in variety of strategies. This research aims to detect three common diseases such as acne, hyper pigmentation and psoriasis. We proposed an image processing techniques that accepts the digital image of disease, then image analysis to identify the type of disease. The proposed method is very simple, fast and does not need any additional equipment. It accepts input of color image and it resizes the image to extract features using CNN. Then multi class features are classified using first order feature extraction method. Lastly, the type of disease, spread and severity are shown to the user. The system identifies three different types of disease accurately.*

Keywords: Skin disease, Deep Learning, Computer Vision, Digital Image processing

I. INTRODUCTION

These days skin diseases are very common as compared to some other diseases. Some of the common factors for developing skin disease are fungal infection, bacteria, allergy or viruses etc[1]. A skin disease may cause a change in the color or texture of the skin[2]. Skin diseases must be diagnosed at an early stage as sometimes there are chances of it getting converted into cancer. The diagnosis and treatment of a skin disease is very expensive and takes a long time[3].
In certain cases, it might take months to develop symptoms for skin disease. The patient is unaware of skin disease for a long time, and as a result of this, skin disease develops and grows further to advance stage[4].
At times, even a dermatologist (skin specialist doctor) may find it difficult to diagnose the skin disease and may advise for some costly laboratory tests in order to diagnose the type and stage of the skin disease. With the current advancement of lasers and photonics based medical technology, it has now become quicker to diagnose the skin diseases accurately. Still the cost of such diagnosis is very high[5][13]. Deep Learning architecture for image classification gives accurate result in dermatology discipline[11][12]. So we propose ResNet based deep learning approach in order to diagnose the skin diseases. For this method, the digital image of disease effect skin area is taken and then image analysis is done in order to identify the type of disease. Our proposed method is accurate, less computation power when compared to other existing methods and does not need any expensive equipment.

II. REVIEW OF LITERATURE

In [6] a novel method is proposed based on convolution Neural Network to detect the skin disease automatically from dermoscopy images. To classify the skin diseases automatically , two different methods were proposed . one is Convolutional Neural Network and another one is the combination of Convolutional Neural Network and one- versus-all. These two approaches achieves classification accuracy 77% and 92.90% respectively.
In the research work [7], Ant Colony based segmentation and KNN and ANN based classification algorithm has been proposed in order to detect the melanoma and benign skin lesions. 12 features seem to be sufficient to detect malignant melanoma. Moreover, ANN gives better results than KNN.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

In [8], a skin lesion segmentation approach based on the elitist-Jaya optimization algorithm has been proposed. This algorithm consists of two stages: image preprocessing and edge detection. The result is proved that the proposed approach improved the segmentation accuracy of the affected skin lesion area.

In this study[9], a new approach called Dermoscopic Expert has been proposed . It combines the pre-processing and hybrid Convolutional Neural Network (hybrid-CNN). The proposed pre-processing method applies lesion segmentation, augmentation, and class rebalancing . The experimental results improve the accuracy of 10.0% and 2.0% than that of Existing works.

From the above literature following problems are identified.

1. The convolutional neural network gives better results when compared to traditional method for processing the digital image. But still accuracy rate should be increased for the larger datasets.
2. Image pre processing plays vital role to detect the skin diseases automatically. Many researchers have focused only on Feature extraction and classification algorithm. If we apply some pre processing techniques then classification results will be improved.
3. Segmentation through convolutional neural network improves the classification results as well.

In order to classify three different types of skin diseases , the convolutional neural network must be improved.

III. SYSTEM AND METHODOLOGY PROPOSED

In this section, the detection, extraction and classification of skin disease are described as follows. The methodology of proposed system includes Image pre-processing , first order Feature Extraction and image classification. The system will help in detection of Acne, Hyper pigmentation and Melanoma with less computational efforts. The architecture of system is shown in Fig 1. Below.

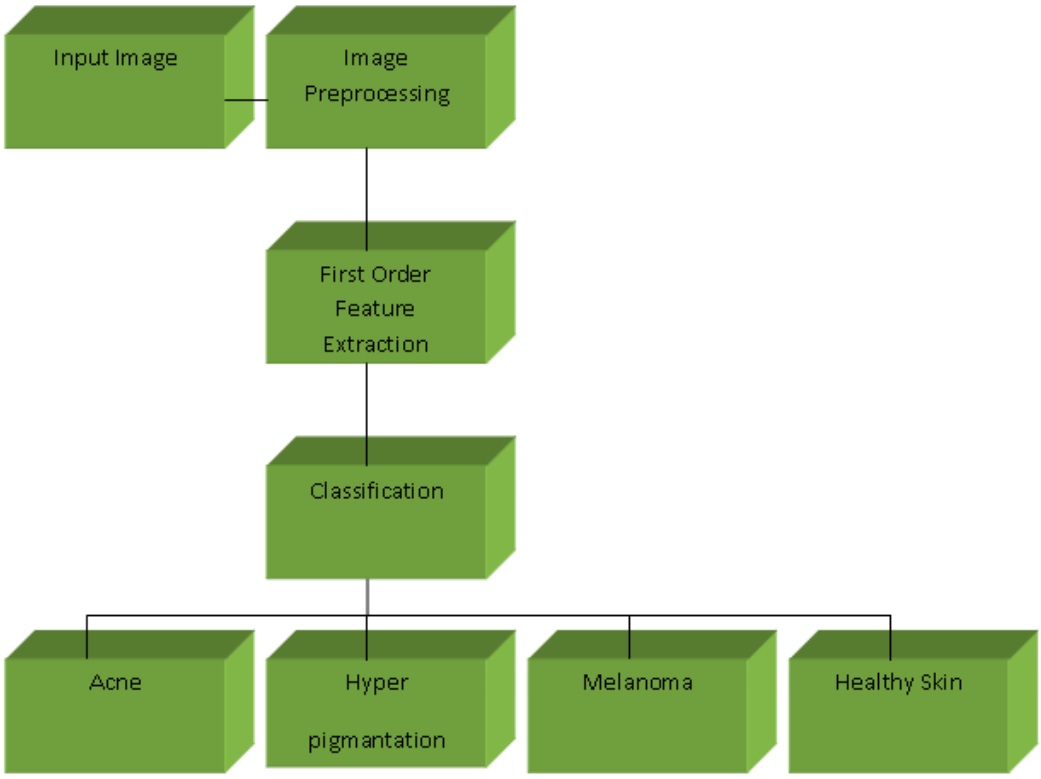

Fig. 1. Architecture of Proposed System

The Skin Colored input images taken from IISC Dataset, Consist of acne, hyper pigmentation and Melanoma images. Image preprocessing is done for achieving good quality images. The images obtained from the dataset are not of the required size and hence need to be resized accordingly. The following sections explain the image resizing techniques.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

3.1 Image Resizing

The dataset consists of different sizes of the image. It is either increase or decrease the size in order to resolve the different size of images. Image resize also increases the performance of the system and decreases the processing time. Fig 2 and Fig 3 show images before and after resizing.

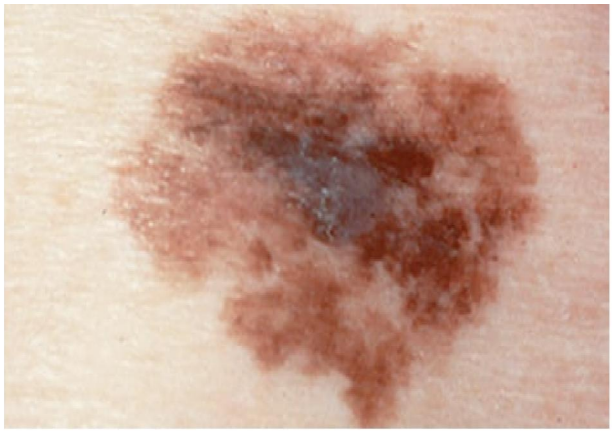

Fig. 2: Example of original Image of Melanoma

Fig. 3: Example of Melanoma image after resizing

After preprocessing, Next stage in the architecture is feature extraction. It is very important to apply appropriate method for extracting the features from the image. The proposed system uses first order feature extraction, using 4 parameters, such as contrast, variance, standard deviation and smoothness. And then classification is done using CNN ResNet50. A ResNet 50 can train classifier using extracted features from the training set. The architecture of ResNet 50 model is illustrated in fig 4.

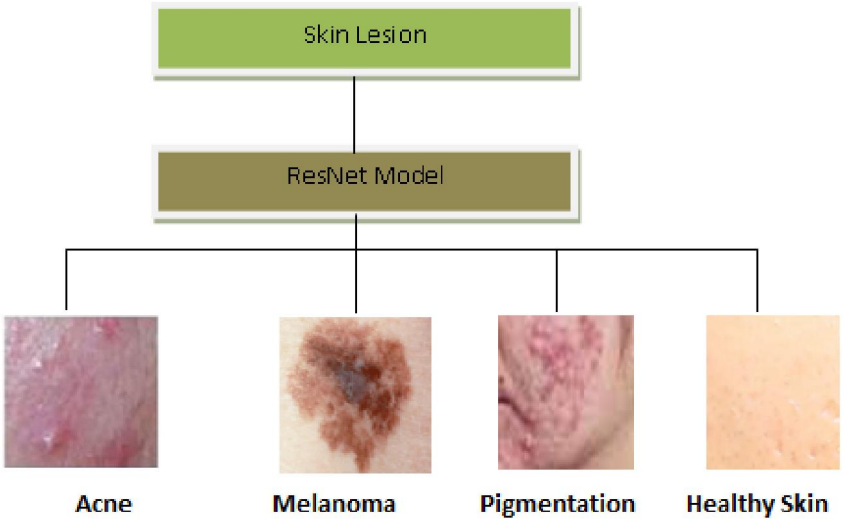

Fig 4: Classification of skin Diseases

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

IV. RESULTS AND DISCUSSIONS

We have used the concept of transfer learning for the classification. With transfer Learning, Instead of starting the learning process from scratch, the model starts patterns that have been learned while solving a different problem. This way the model leverages previous learning and avoids starting from scratch. The image classification is usually expressed through the use of pre trained model. A predefined model is a model that was trained on a large benchmark dataset to solve a problem similar to the one that need to be solved. Results of Resnet Model in terms of different parameters such as Accuracy, Precision, Recall, F1 Score and ROC-AUC are given in the table 1. The proposed method achieved accuracy rate 0f 0.9150. we found that ResNet has achieved the best accuracy among the other models. Moreover, We obtained F1 Score is 0.915 which means that interpretation of results is good.

Pre Trained Model	Accuracy	Precision	Recall	F1 Score	ROC-AUC
ResNet 50	0.9150	0.8891	0.926	0.916	0.915

Table 1: Result of ResNet Model

The proposed system classified the skin disease dataset into three classes: class 0: Acne, Class 1: Melanoma, and Class 2: Hyper Pigmenation . The accuracy rate of various classes are given in the table:2

Classification	Precision	Recall	F1 Score
Class 0: Acne	0.94	0.90	0.92
Class 1: Melanoma	0.93	0.90	0.93
Class 2: Hyper Pigmentation	0.95	0.93	0.91
Accuracy	0.91	0.90	0.92
Weighted Avg.	0.91	0.91	0.91

Table 2: Classification Report of ResNet Model

V. CONCLUSION AND FUTURE SCOPE

Detection of skin disease is crucial step to reduce the death rates as it turns into skin cancer. Medical procedure for diagnosis of skin disease is very expensive and time consuming. Image processing system is used to build the screening system for dermatology at an initial stage. Preprocessing and feature extraction plays a vital role in helping classify skin disease.

The proposed model based on the Resnet approach proved efficient for skin disease classification and detection with minimal computational power and effort. The outcome is promising, with an accuracy of 93.47% when experimented with and compared with other methods over the real time images acquired from kaggle. The model is computationally effective with CNN architecture. In future, the proposed model can be enhanced with segmentation algorithm and other optimization algorithms.

REFERENCES

[1]. Goswami, Tanvi & Dabhi, Vipul & Prajapati, Harshadkumar. (2020). Skin Disease Classification from Image - A Survey. 599-605. 10.1109/ICACCS48705.2020.9074232.

[2]. Mitchell, John AU - Wei, Li-sheng AU - Gan, Quan AU - Ji, Tao PY - 2018 Skin Disease Recognition Method Based on Image Color and Texture Features https://doi.org/10.1155/2018/8145713

[3]. Liu, Y., Jain, A., Eng, C. et al. A deep learning system for differential diagnosis of skin diseases. Nat Med 26, 900–908 (2020). https://doi.org/10.1038/s41591-020-0842-3

[4]. Kanji A (2018) . Perspective on Living With a Skin Condition and its Psychological Impact: A Survey. J Patient Exp. 2019 Mar;6(1):68-71. doi: 10.1177/2374373518774397.

[5]. Sehgal, Virendra. (2016). Diagnosis and Treatment of Common Skin Diseases. 10.5005/jp/books/12901.

[6]. Kemal Polat, Kaan Onur Koc (2020). Detection of Skin Diseases from Dermoscopy Image Using the combination of Convolutional Neural Network and One-versus-All. Journal of Artificial Intelligence and Systems, 2, 80–97. https://doi.org/10.33969/AIS.2020.21006.

[7]. Fekrache Dalila, Ameur Zohra, Kasmi Reda, Cherifi Hocine, Segmentation and classification of melanoma and benign skin lesions, Optik, Volume 140, 2017, Pages 749-761,ISSN 0030-4026,

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

https://doi.org/10.1016/j.ijleo.2017.04.084.

[8]. Marwa A. Gaheen, Enas Ibrahim, Ahmed A. Ewees, Edge detection-based segmentation for detecting skin lesions, Editor(s): Pardeep Kumar, Yugal Kumar, Mohamed A. Tawhid,In Intelligent Data-Centric Systems,Machine Learning, Big Data, and IoT for Medical Informatics,Academic Press,2021,Pages 127-142,ISBN 9780128217771, https://doi.org/10.1016/B978-0-12-821777-1.00008-2.

[9]. Md. Kamrul Hasan, Md. Toufick E. Elahi, Md. Ashraful Alam, Md. Tasnim Jawad, Robert Martí,DermoExpert: Skin lesion classification using a hybrid convolutional neural network through segmentation, transfer learning, and augmentation, Informatics in Medicine Unlocked, Volume 28,2022,100819,ISSN 2352-9148, ttps://doi.org/10.1016/j.imu.2021.100819.

[10]. philipp Tschandl, Christoph Sinz, Harald Kittler, Domain-specific classification-pretrained fully convolutional network encoders for skin lesion segmentation, Computers in Biology and Medicine, Volume 104, 2019, Pages 111-116, ISSN 0010-4825, https://doi.org/10.1016/j.compbiomed.2018.11.010.

[11]. Cullell-Dalmau Marta, Noé Sergio, Otero-Viñas Marta, Meić Ivan, Manzo Carlo , Convolutional Neural Network for Skin Lesion Classification: Understanding the Fundamentals Through Hands-On Learning, Journal of Frontiers in Medicine ,Vol 8 ,2021 ,DOI=10.3389/fmed.2021.644327.

[12]. Kassem MA, Hosny KM, Damaševičius R, Eltoukhy MM. Machine Learning and Deep Learning Methods for Skin Lesion Classification and Diagnosis: A Systematic Review. Diagnostics (Basel). 2021 Jul 31;11(8):1390. doi: 10.3390/diagnostics11081390. PMID: 34441324; PMCID: PMC8391467.

[13]. Hatem, M.Q. Skin lesion classification system using a K-nearest neighbor algorithm. Vis. Comput. Ind. Biomed. Art 5, 7 (2022). https://doi.org/10.1186/s42492-022-00103-6