International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 10
***Article Received:** 22 August 2023 **Revised:** 12 October 2023 **Accepted:** 25 October 2023*

Survey on Therapy Prediction using Deep Learning for Pores and Skin Diseases

[1]C Mohammed Gulzar, [2]Dr S Meera
[1]Research Scholar, [2]Associate Professor
[12]Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, Tamilnadu, India
[1]E-Mail: gulraj80@gmail.com, **[2]E-Mail**: meeraselvakumar@gmail.com

Abstract:

Introduction: Prediction and detection of skin ailments have generally been a hard and important task for health care specialists. In the cutting-edge situation majority of the pores and skin care practitioners are the uses of traditional techniques to diagnose the ailment which may also take a large amount of time. Skin Diseases are excessive troubles in recent times as it is a consider form of environmental factors, socioeconomic elements, loss of entire weight loss program, and so on. Identifying the particular skin disease by computer vision is introduced as a novel task. Based on skin or pore disease, certain therapy can be suggested. In proposed study there are different applications based on deep learning are studied with computer vision task for better performance of proposed application. Famous deep learning algorithms may include CNN (convolutional neural network) , RNN (Recurrent Neural network), etc.

Objective: To diagnose skin disease with dermoscopic images automatically. Developing automated strategies to improve the accuracy of analysis for multiple psoriasis and skin diseases

Methods: In existing techniques many machine learning models are used which is having high complexity and require more time for analysis. So, in this study different deep learning models are studied for understanding performance difference between different models. This paper is a comparative check about skin illnesses related to ordinary skin issues in addition to cosmetology. Image selection, segmentation of skin disease detection and classification are the important steps can be used for oily, dry, and ordinary pores.

Result: The field of dermatology has seen promising results from studies on various Convolutional Neural Network (CNN) algorithms for classifying skin diseases based on clinical images. These studies have concentrated on utilizing the strength of deep learning and computer vision techniques to classify and diagnose different skin conditions using facial images precisely.

Conclusion: A survey of numerous papers is achieved on basis of technologies used, outcomes with accuracy, moral behavior, and number of illnesses diagnosed, datasets. Different existing research methodologies are compared with present deep learning architectures for understanding superior performance of deep learning models. Using deep learning, we can predict pore and skin diseases. In proposed study, introduction to different algorithms of deep learning which are combined with computer vision tasks to find the skin disease and pore disease are studied. Therapy can be predicted based on type of skin or pore disease.

Keywords: CNN, Deep learning, Classification, facial skin disease, therapy prediction, pores and skin disease detection.

I. INTRODUCTION

A skin illness is any condition that affects the skin, the biggest organ in the human body, often known as a dermatological problem, dermatosis, or skin condition. Skin ailments can range from minor, transient issues to persistent, debilitating conditions that severely impact a person's health and quality of life.

Skin diseases are prevalent health issues that affect millions of individuals worldwide. Accurate and timely diagnosis of these conditions is crucial for effective treatment and management. In recent years, deep learning has shown remarkable potential in various medical applications, including the classification of skin diseases. This survey explores the use of deep neural networks for the classification of skin diseases based on visual information, particularly focusing on pores and skin texture analysis.

Skin conditions come in many forms, including causes, signs, and remedies. Typical illustrations include:

- Acne
- Eczema
- Psoriasis
- Dermatitis
- Rosacea
- Skin Cancer
- Autoimmune Skin Disorders
- Fungal Infections
- Bacterial Infections

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 10
***Article Received:** 22 August 2023 **Revised:** 12 October 2023 **Accepted:** 25 October 2023*

- Viral Infections

In healthcare domain one of the most important considerations is human body and skin. There are many advantages of skin disease detection using software analysis such as early prediction of skin disease, prevention of different complications in future, impact on psychological health of human. On time detection of skin disease gives better life quality as well as reduces burdens on family or society as there is lead in healthcare.

Fig.1. Acne (a, b), Rosacea (c), Hemangioma (d), Psoriasis (e), Seborrheic Dermatitis(f)

The skin is the largest organ of the body and serves as a protective barrier between the internal organs and the external environment. Skin diseases can manifest in various forms and result from a wide range of causes, including genetics, infections, allergies, autoimmune reactions, environmental factors, and more.

Acne is common found disease in humans which causes different abnormalities and pimples on upper torso and also on facial region.

The symptoms that causes bumps with pus-filled in it on facial part. Even such skin disease causes redness symptoms. This type of skin disease found commonly in mid-aged ladies.

The hemangioma skin disease has purple and red marks on different parts of body as back ,chest and on face. This type of skin disease is commonly found in new born babies.

Psoriasis type of skin disease forms itchy as well as dry patches on skin. It is commonly found on elbows and knee. This type of disease even spreads more with infections and one of the painful disease.

Seborrheic Dermatitis is most commonly found on the scalp with red color patches. This is also found on oily part of body. It will not do any harmful to body but it's a fungal disease and need to cure.

According to a survey conducted in 2010, skin conditions were the fourth most common cause of nonfatal diseases worldwide, and three of the ten most prevalent conditions were skin conditions. Skin conditions have incurred enormous financial consequences for both high-income and low-income countries. A person's relationships with others, mental health, physical activity, job, and social life can all are adversely affected by skin conditions. Some are basic types of skin diseases,

- **Normal Skin:** The sebaceous glands create the right quantity of sebum when the skin is balanced. It has a uniform tone and a smooth texture and typically doesn't get very dry, oily, or sensitive.
- **Dry Skin:** Lack of adequate moisture and oil production are the hallmarks of dry skin. It could seem drab or flaky and feel tight and gritty. A skin barrier frequently damaged in people with dry skin makes them more sensitive and dangerous to irritation.
- **Oily Skin:** Sebaceous glands produce excessive sebum in people with oily skin. The skin may look oily and glossy and have increased pores. Due to the extra oil blocking the pores, oily skin is more likely to develop blackheads, whiteheads, and acne breakouts.

The development of clogged pores, microscopic openings in the skin that produce sweat and oil from glands when they become clogged with dead skin cells, oil, or dirt, is frequent on people's faces.

Skin illnesses frequently bring on skin pigmentation, plaques, scales, and lesions, other symptoms. Pain and deformity are the long-term effects of these illnesses. Such damage, mainly when it affects the face, harms physical health and contributes to major mental issues. According to studies, people with primary skin conditions, including psoriasis, alopecia areata, and vitiligo, are more likely to experience mental health issues like depression and anxiety. Additionally, several therapies for skin conditions run the risk of causing mental illness.

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 10
***Article Received:** 22 August 2023 **Revised:** 12 October 2023 **Accepted:** 25 October 2023*

Skin diseases encompass a wide range of conditions, from common issues like acne and eczema to more severe disorders like melanoma and psoriasis. Early detection and classification of these diseases are critical for effective intervention and patient care. Traditional diagnostic methods often rely on visual inspection by dermatologists, which can be subject to variations in expertise and may not always provide consistent results.

Skin with insufficient melanin is more vulnerable to the sun's harmful ultraviolet rays and the risk of sunburn. According to analysts, the infection must be treated quickly to identify the side effects, making it easier for doctors and dermatologists to prevent it. This problem has turned out to be arbitrary. The progression of wounds in the skin that vary in form, size, colour, and surface are used to define it. Numerous skin conditions, including skin eruption, alopecia, ringworm, and dermatitis, also impact appearance. Therefore, protecting the skin from diseases is a crucial and challenging medical task.

The core of this survey is to provide an overview of the recent advancements and challenges in the application of deep neural networks for the classification of skin diseases. It delves into the different architectures and methodologies employed in these systems, the datasets used for training and validation, and the performance metrics used to evaluate their efficacy.

II. LITERATURE SURVEY

There are different researchers working on identification of different types of skin diseases. In proposed study there is complete understanding and explanation of computer vision based skin disease detection and deep learning is used for skin disease classification. In this topic, references with their methods and limitations are discussed.

Healthcare professionals have always struggled with the complex and crucial duty of predicting and detecting skin conditions. Most skin care professionals still employ time-consuming old methods to identify their patients' needs. An untrained skin contamination identification approach using a more effective deep neural network community model has been suggested. Skin diseases are major problems today since they consider socioeconomic issues, environmental variables, loss of one's entire weight reduction program, and other things. This essay compares and contrasts several skin conditions related to typical skin problems and cosmetology. The database images are divided into groups using sophisticated stage set approach-based segmentation.

All images feature extraction has been completed to obtain the feature vector. This examination also compares skin types, including normal, dry, and Oily skin. Many publications are reviewed based on the technologies employed, the accuracy of the results, the moral behavior, and the number of illnesses that have been accurately identified, the datasets, and many other factors. For various skin problems, a robust neural network is applied. Modern techniques like ANN and SVM are used to evaluate the performance [1]

Deep convolutional neural networks have shown encouraging results for image categorization applications in recent years. They have been used in research because ResNETs can resolve the vanishing gradient issue in dense networks. Results, however, can vary according to the ResNET topologies used, the batch sizes, and the number of images used during training and testing. Therefore, how activation functions and residual connections affect picture classification remains unknown. Additionally, Nevertheless, the same data sets should be used to evaluate the outcomes of different ResNET models effectively.

Different network models have been created by author to examine the effects of two activation functions (SELU and ReLU) and residual learning for image categorization utilizing the same data sets. ResNET with SELU and without a residual block generates the most amazing validation accuracy for image classification, 97.01%, according to test findings and comparative analyses. [2]

Author from reference [3], designed an effective method for identifying skin diseases using an improved deep neural network model. A level-set approach-based segmentation technique is used to separate database images into groups. To obtain the feature vector for each image, features are extracted using GLCM. Skin conditions are categorized using a deep neural network based on dragonfly optimization. To show the effectiveness of the dragonfly-based DNN, several evaluation metrics, including specificity, sensitivity, and accuracy are examined using methods like SVM and ANN.

The system is developed using software platform. Recent advances in machine learning techniques have increased the effectiveness of skin illness detection, but the classification of skin disorders has yet to see an increase in accuracy. Other strategies have been employed, including neural networks, SVM, optimization techniques, and classification algorithms. It has been found that when classifying the skin database photos as usual and pathological for different metrics, segmented images provide an accuracy of 98%. [3]

International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 10
***Article Received:** 22 August 2023 **Revised:** 12 October 2023 **Accepted:** 25 October 2023*

The rare autoimmune condition known as systemic sclerosis (SSc) is characterized by significant skin and internal organ fibrosis. Early disease detection is essential to create efficient treatment and care regimens. Medical speech recognition and image processing are two domains where machine learning algorithms, and intense learning, are extremely helpful in biomedical, healthcare, medicine and Biology applications. In this study newly invented pretrained model is used for training named 'MobileNetV2'. Diagnosis accuracy and computational efficiency of MobileNetV2 is far better than state of art techniques.

Author [4] implemented deep learning-based model for skin disease detection which provide testing accuracy of 95.2% , validation accuracy of 96.8% and 100% accuracy for training dataset. Less than five hours were spent on the training. We also used the same laptop to analyze the identical normal versus SSc skin image sets using CNN. On the training picture set, the CNN achieved 100% accuracy; on the validation image set, 87.7%. Additionally, training the CNN architecture took more than 14 hours. We also analyzed a second batch of photos using the MobileNetV2 model, categorizing them as usual, early SSc or late (severe) SSc skin images. Our investigation, designed to demonstrate the effectiveness of the suggested network architecture, has promising results for the characterization of SSc. [4]

A non-invasive optical technique called Raman spectroscopy may evaluate biological tissue's conformations and molecular structures. Time-consuming data-collecting processes have limited past clinical applications of Raman spectroscopy since Raman scattering is unlikely.

In this presentation, we describe the initial clinical outcomes of the real-time Raman system. So far, 289 benign and cancerous skin lesions have been found. We found that skin cancers could be distinguished from benign skin lesions with a specificity of 75% and sensitivity of 91% when we used linear discriminant analysis and partial least squares regression to analyse the Raman spectra, and malignant melanoma could be distinguished from benign pigmented lesions with a specificity of 78% and sensitivity of 97%. [5]

The most contagious dermatological condition in the world, human skin disease, is initially identified by sight. Medically required procedures include dermoscopic investigation and clinical screening of scrapings and skin biopsies for proper classification. The data security, varied colors, and complicated formation concerns make it more challenging to classify skin illnesses using medical photographs.

To ensure data privacy, this work generated a custom image dataset with four classes of skin illnesses, suggested a CNN model, evaluated it against other benchmark CNN algorithms, and tested the efficacy of federated learning. An image augmentation strategy was applied to expand the model and increase the dataset.

For psoriasis, eczema, and Acne the model [6] provides precision of 60%, 43%, and 86%, and recall of 60%, 60%, and 67%. The model in the federated learning strategy had an average accuracy of 94.15%, 91.15%, 86.57%, and 81.21%, when the dataset was distributed among 2500, 2000, 1500, and 1000 data. [6]

The Global Burden of Disease (GBD) Study 2010 calculated the GBD from 1990 to 2010 for 187 countries related to 15 categories of skin diseases. We conducted systematic data analysis and literature reviews for the following conditions: abscess, impetigo, fungal skin conditions, scabies, urticaria, decubitus ulcer, alopecia areata, pruritus, acne vulgaris, eczema, psoriasis, and other bacterial skin conditions, non-melanoma molluscum contagiosum, viral warts, and cellulitis skin cancer. To calculate the nonfatal burden, we used disability estimates.

The top 10 most common diseases in the world in 2010 included three skin conditions— various skin acne, and subcutaneous infections, and fungal skin diseases—and eight more—fell into the top 50. The other five skin conditions were molluscum contagiosum, scabies, impetigo, eczema, and pruritus. At the national level, skin conditions were the second to the eleventh most common cause of years living with a disability. Skin problems were the fourth most common nonfatal disease burden worldwide. [7]

Skin serves as a barrier to shield our inside organs from various threats. However, skin damage can result from diseases brought on by fungi, viruses, or even dust. A little skin lesion can potentially develop into a significant health concern. A proper diagnosis might aid a prompt recovery from a skin illness. This study attempts to create a Convolution Neural Network (CNN)-based system for detecting skin conditions. The Efficient Channel Attention (ECA) block and EfficientNetV2 are the foundation of the model known as Eff2Net.

It was observed that doing so caused the total number of trainable parameters to drop significantly. The CNN used by author [8] learned roughly 16 M parameters to categories the condition, which is more than other deep learning techniques. These four categories acne, psoriasis, melanoma, and actinic keratosis (AK) were utilized to categories skin conditions in this investigation. The model's overall testing precision was 84.70%. [8]

In the modern era, human skin disease has grown widely, affecting millions of Americans with different skin

problems. These conditions frequently carry unacknowledged hazards that put sufferers at risk for psychological discomfort, skin cancer, and self-confidence loss. Identifying these diseases often requires highly competent medical personnel and specialized equipment due to the poor visual quality of images of skin diseases.

Additionally, diagnosing skin conditions by hand is frequently arbitrary, tiresome, and needs more labour. Therefore, a computer-based method is required to identify skin problems automatically. Most past studies on skin disorders used CNN similarly using traditional loss functions, which constrained the model's ability to learn distinctive features from skin images. [9]

Melanoma is extremely dangerous because it spreads through metastasis. Melanoma is responsible for the majority of skin cancer-related deaths, according to statistics. Another study found that patient survival rates are connected to the stage of the disease; earlier melanoma detection and treatment is associated with greater survival rates. Examining the skin lesions texture, colour, and shape, is critical for early prevention and detection of melanoma. Malignant melanomas include asymmetrical shapes, notched edges, and a range of colors.

The first component introduces a novel equation to calculate when the skin will burn to help consumers prevent sunburn caused by sunlight. Segmentation, feature extraction, classification, hair recognition exclusion, and Image acquisitions comprise the second part of an automated image analysis module. The testing outcomes show that the author [10] approach is practical, correctly categorizing innocent, atypical, and melanoma images with 96.3%, 95.7%, and 97.5% accuracy, respectively. [10]

Therapy suggested for different diseases includes as below,

- Acne: antibiotics and cleanser
- Rosacea : anti acne medication
- Hemangioma : laser surgery
- Psoriasis : medication and photodynamic therapy
- Seborrheic Dermatitis: use of medicated shampoos , medicated lotion etc.

III. CONCLUSION

The field of dermatology has seen promising results from studies on various Convolutional Neural Network (CNN) algorithms for classifying skin diseases based on clinical images. These studies have concentrated on utilizing the strength of deep learning and computer vision techniques to classify and diagnose different skin conditions using facial images precisely. We studied various papers on skin and pore disease detection. There are different skin diseases such as oily, normal and dry. Further study is needed to validate CNN algorithm performance in real-world medical so new with advancement to previously used model is suggested for future evaluation. Future research will include different metric improvement using recent DNN model and advance optimization technique.

Future research also include the easy availability of application to user so we recommend to design web based application or android based application for real time skin disease detection and prediction using different computer vision and machine or deep learning techniques.

REFERENCES

[1] Z. Wu et al is developed by Studies on different CNN algorithms for face skin disease classification based on clinical images, doi: 10.1109/ACCESS.2019.2918221.

[2] E. Groceri is developed by analysis of deep networks with residual blocks and different activation functions: classification of skin diseases, doi: 10.1109/IPTA.2019.8936083

[3] K. Melbin and Y.J.V are developed by Raj, An enhanced model for skin disease detection using dragonfly optimization based deep neural network doi: 10.1109/I-SMAC47947.2019.9032458

[4] M. Akay et al. is developed by Deep learning classification of systemic sclerosis skin using the MobileNetV2 Model, doi: 10.1109/OJEMB.2021.3066097.

[5] Zhao J, Lui H are developed by Real time Raman Spectroscopy for non-invasive skin cancer detection preliminary results doi: 10.1109/IEMBS.2008.4649861

[6] M.N. Hosen, V. Panneerselvam, are developed by, Federated machine learning for detection of skin disease and enhancement of internet of medical things, doi: 10.1109/JBHI.2022.3149288.

[7] Hay RJ, Johns NE, Williams HC, are developed by The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions.. doi: 10.1038/jid.2013.446

[8] R. Karthik, Tejas sunil vaichole, are developed by, Eff2Net: An efficient channel attention-based convolutional neural network for skin disease classification, https://doi.org/10.1016/j.bspc.2021.103406.

[9] B. Ahmad, M. Usama, are developed by "Discriminative Feature Learning for Skin Disease Classification Using Deep Convolutional Neural Network, doi: 10.1109/ACCESS.2020.2975198.

[10] Abuzaghleh, Omar, Buket D. Barkana, are developed by "Noninvasive real-time automated skin lesion analysis system for melanoma early detection and prevention.

[11] A. Bewley, is developed by ‘‘The neglected psychological aspects of skin disease,’’ Brit. Med. J., vol. 358, p. 3208, Jul. 2017.

[12] Maglogiannis, Ilias, Elias Zafiropoulos, are developed by "Intelligent segmentation and classification of pigmented skin lesions in dermatological images."

[13] Lakshay Bajaj, et al., is developed by “Automated system for prediction of skin disease using image processing and machine learning ”

[14] D.Khanna et al, is developed by “Standardization of the modified Rodanan Skin score for use in clinical trials of systemic sclerosis”

[15] P. Clements et al. is developed by “Inter and intraoberver variability of total skin thickness score in systemic sclerosis”

[16] Pravin R, MAbdulrhman, 2022, “Deep Learning Approaches for Prognosis of Automated Skin Disease”, pp.1-16.

[17] Joshi N.J. and BurlinaP.M, 2019, “Automated detection of erythema migrans and other confounding skin lesions via deep learning”, 105:151-6.

[18] Garware B. and KulhalliR, 2019, “A Hierarchical Approach to Skin Lesion Classification,”,pp. 245-250.

[19] K. Mali,BasuA, 2017, “Image based skin disease detection using hybrid neural network coupled bag-offeatures”,IEEE, pp. 242-246.

[20] V. Sabooand Kumar V.B, 2016, “Dermatological disease detection using image processing and machine learning,”IEEE,pp. 1-6.