NavaJyoti, International Journal of Multi-Disciplinary Research
Volume 9, Issue 1, June 2025

Skin Disease Diagnosis using Convolutional Neural Networks

Pallavi P[1] , Rajesh Dharmaraj[2]

[1]Student, Department of Computer Science(PG), Jyoti Nivas College Autonomous, Bangalore, India
[2] Associate Professor, Department of Computer Science(PG), Jyoti Nivas College Autonomous, Bangalore, India

Abstract

Skin diseases are prevalent globally, and their diagnosis is often challenging due to variations in skin texture, the presence of hair, and differences in skin color. Many patients in remote areas lack access to medical facilities, leading to delayed detection and worsening conditions. Traditional diagnostic methods are time-consuming, making it essential to develop automated techniques using machine learning to enhance accuracy and efficiency.

This research proposes a deep learning-based system for skin disease identification, incorporating preprocessing, feature extraction, training, and testing stages. Convolutional Neural Networks (CNNs) are employed to learn intricate patterns in skin images, distinguishing between normal and diseased skin based on texture, color, and irregularities. Transfer learning is used to leverage pre-trained models, optimizing performance with limited annotated medical datasets.

The system undergoes validation and testing on diverse datasets to ensure generalizability and reliability. Performance evaluation is conducted using sensitivity, specificity, and accuracy metrics, comparing results with existing clinical methods. The proposed approach enhances the discriminative power of input data, improving diagnostic precision.

By utilizing deep learning, the system provides a non-invasive, efficient, and accurate tool for skin disease detection, reducing dependency on manual diagnosis. This research contributes to the advancement of computer-aided diagnosis, facilitating early detection and timely treatment. The primary goal is to achieve high accuracy in skin disease prediction, making healthcare more accessible and reliable, particularly in underserved areas.

Keywords: Skin Disease, Machine Learning, Deep Learning, CNN, Transfer Learning.

1. Introduction

Skin is the largest organ of the body which provides protection, regulates the body fluids and temperature, and enables sense of the external environment. Skin diseases are the most common cause of all human illnesses which affects almost 900 million people in the world at any time According to the global burden of disease project, skin disease is the fourth leading cause of non fatal disease burden throughout the world. An estimated 21% of children in world are affected by diseases. The common procedures for diagnosing skin diseases are patient

history and symptoms analysis, skin scraping, visual inspection, dermoscopic examination and skin biopsy However, these diagnosis methods are tedious, time-consuming, and prone to subjective diagnosis. Most of them require experience and excellent visual perception of dermatologist. The availability of smartphones equipped with digital cameras enables the acquisition of clinical images for investigation using Image Processing and Machine Learning Skin diseases are more common than other diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. A skin disease may change texture or colour of the skin. In general, skin diseases are chronic, infectious and sometimes may develop into skin cancer. Therefore, skin diseases must be diagnosed early to reduce their development and spread. The diagnosis and treatment of a skin disease takes longer time and causes financial and physical cost to the patient The skin is the outer layer of the body. It is frequently exposed to the environment, where it may come into touch with dust, microorganisms, and UV radiation. These might be the causes of any disease. Skin-related disorders are made more complicated by genetic instability. The skin is connected to several skin diseases, affecting a person's appearance and capacity to operate. Skin infections are caused by bacteria, fungi, or viruses.

2. Literature Review

"Identification of skin disease using machine learning" by Minakshi M. Sonawane, Ramdas D. Gore, Ramesh R. Manza Department of Computer Science and IT, Dr. Babasaheb Ambedkar Marathwada University, Maharashtra, India (2023) The study of enhanced technological advancement in combination with digital image processing for disease classification. The SVM-based supervised learning system, multi-model, and multilevel technique for analysis were employed by the researchers to identify eczema. Based on the hue of the fingernails, the SVM was used to identify various circulatory infections. Using melisma images as a diagnostic tool, infections were identified. The system is capable of accurately recognizing the. Existence of basal-cell carcinoma using adequate thresholding values with a percentage reliability of 91.33 percent in the detection. They took images from the government medical hospital in Aurangabad. They collected photographed patient disease images while dermatologists. To identify images from the clinical dataset, we have taken five types of skin disease datasets such as acne, psoriasis, eczema, warts, and ulcers. The methodology of the proposed system consists of preprocessing, segmentation, feature extraction, and classification. In Image Preprocessing, to remove noise unnecessary noise they used filters such as Gaussian filters, adaptive filters and median filters. The Gaussian filter performs better than other filters, with 18.67 MSE, 12.81 PSNR and 5.26 entropy values. For Image segmentation, they used K-Means Clustering method to segment the skin disease image. The image segmentation with K-Means Clustering results is subjected to the post preprocessing stage. Because these findings are considered less than ideal and could include noise or small things. The method makes use of binary image processing techniques, including the Gaussian filter, noise reduction, border cleaning, the masking process, and cropping images of skin disorders. In this research, the color method that was tested had the best accuracy in recognizing features of skin disease. They used color features, SVM, Hopkins, Elbow techniques for classification of skin disease. Here SVM given the good accuracy in the Acne(94%), eczema(92%), and ulcer(95%) and color feature is given 100% accuracy RESULT: They have got less accuracy for texture features in the training and testing datasets, at 86.23 percent and 75%, respectively.

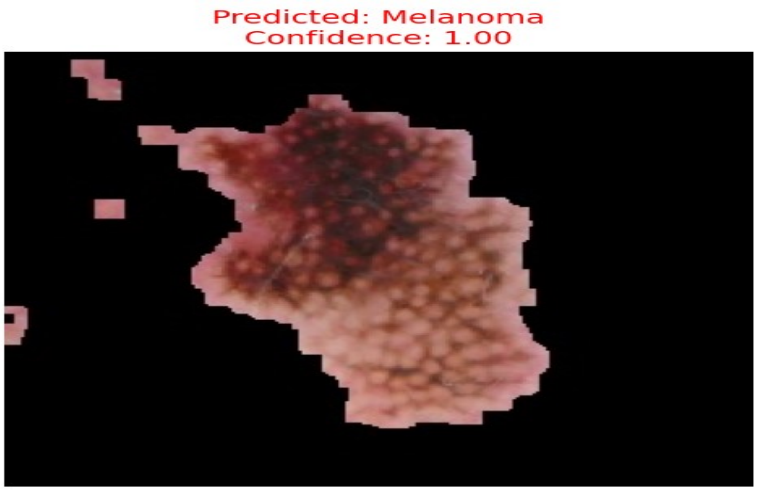


Fig.1 Predicted Melanoma

3. Methodology

Convolutional neural network (CNN) was one of artificial intelligence that popular in feature learning and object classification. CNN using high performance of GPUs, it makes CNN capable of training a network on a large-scale dataset so the performance can be better. Many studies show that CNN are surpass human in many computer vision tasks. Therefore, I propose to construct a skins disease identification and classification system with CNNs. However, the dataset of skin disease is needed to build CNNs identification system. HAM10000 was used in this system to train the CNN. This dataset contains 10015 dermoscopy images of five type of skin cancers.



Fig.2. Dataset

1. Data Collection: Gather a comprehensive dataset of MRI images, ensuring diversity in terms of different types and stages of brain tumors, as well as images without any tumors. This step is crucial for training a robust model that can handle various scenarios.
2. Data Preprocessing: Apply preprocessing techniques to standardize the images. Normalization ensures consistent pixel intensity values, while augmentation involves creating variations in the dataset by applying random transformations such as rotation,

scaling, and flipping. This improves the model's ability to generalize to different imaging conditions.

3. Dataset Splitting: Divide the dataset into two subsets: the training set for model training and the testing set for assessing the final model's performance on unseen data.
4. Classification: Classification is the task of assigning a label or category to each input sample based on the model's predictions. In skin disease identification and classification would involve predicting the type of skin disease present in an image.
5. CNN Model Design: Design the architecture of a Convolutional Neural Network (CNN) tailored for image classification, considering factors like the number of layers, filter sizes, and activation functions. CNNs are particularly effective for image-related tasks due to their ability to capture spatial hierarchies.
6. Model Training: Train the CNN model on the training set using an optimization algorithm to minimize the difference between predicted and actual disease labels. This includes specifying the number and types of layers, activation functions, and other parameters that determine how the model will learn from the data.
7. Model Evaluation: Evaluate the trained CNN model on the validation set using various metrics such as accuracy, sensitivity (true positive rate), specificity (true negative rate), and the area under the receiver operating characteristic curve. Common evaluation metrics for classification tasks include accuracy, precision, recall, and F1 score.
8. Results Analysis: Analyze the results obtained from the model evaluation and testing phases. Understand any areas of improvement or potential limitations, and consider further refinement or adjustments to the model architecture if necessary.

4. Conclusion

In this project, we developed a skin disease identification and classification system using deep learning with Python and TensorFlow. The system takes skin images as input, preprocesses them, extracts features using a pretrained CNN, and performs classification using a modified CNN model. The evaluation metrics used for this study included precision, recall, F1-score, and support. Our model achieved high accuracy, with a training accuracy of 99.7% and a testing accuracy of 97.7%. This demonstrates the effectiveness of our model in accurately identifying and classifying skin diseases. The use of deep learning and image processing techniques has shown great potential in improving the accuracy and efficiency of skin disease diagnosis In conclusion, our project provides a valuable contribution to the field of dermatology by offering a reliable and efficient tool for the identification and classification of skin diseases. This technology has the potential to revolutionize the way skin diseases are diagnosed and treated, leading to better outcomes for patients.

In the future, the identification and classification of skin disease project could be expanded in several ways to enhance its capabilities and impact. One potential avenue is to incorporate more advanced deep learning models, such as ensemble models or transformer-based architectures, to further improve disease detection accuracy. Additionally, integrating a larger and more diverse dataset could enhance the model's ability to generalize to different populations and skin conditions. Furthermore, the project could benefit from the development of a user-friendly interface or application that allows dermatologists and healthcare professionals to easily upload images, receive predictions, and access additional information or resources related to skin diseases. This could potentially improve the efficiency and accessibility of skin disease diagnosis and treatment planning. Another area for future work could be the development of a mobile application that allows users to perform self-assessments

of skin lesions using their smartphone cameras. This could be accompanied by features such as automatic image quality checks and guidance on how to capture high-quality images, improving the reliability of the model's predictions Another interesting direction for future work could be the integration of telemedicine features, allowing users to consult with dermatologists remotely based on the model's predictions. This could be particularly useful in underserved or remote areas where access to dermatological expertise may be limited.

REFERENCES

1. shanthi, T., R. S. Sabeenian, and rajuanand. "Automatic diagnosis of skin diseases using convolution neural network." Microprocessors and microsystems 76 (2020): 103074.
2. allugunti, viswanathareddy. "A machine learning model for skin disease classification using convolution neural network." International journal of computing, programming and database management 3.1 (2022): 141-147.
3. Verma, anuragkumar, saurabh pal, and surjeetkumar. "Classification of skin disease using ensemble data mining techniques." Asian pacific journal of cancer prevention.
4. Sumithra, ra, mahamadsuhil, and D. S. Guru. "Segmentation and classification of skin lesions for disease diagnosis.
5. zhou, hangning, et al. "Multi-classification of skin diseases for dermoscopy images using deep learning