IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 10, June 2025
Impact Factor: 7.67

Diagnosis Mechanism for Skin Diseases Using Image Processing

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Abstract: *Millions of individuals worldwide face challenges due to skin- related disorders, Skin-related disorders present facing a significant world health challenge, affecting a large portion of the population. Early and accurate diagnosis shows a critical role in ensuring timely treatment and better patient outcomes. However, traditional diagnostic highly depend on dermatologists, which can shows delays, particularly in rural or underserved areas. This project introduces an diagonisis of skin disease system utilizing deep learning techniques, specifically the VGG16 architecture. By analyzing dermoscopic images, the model classifies various skin conditions with high precision. The proposed system demonstrates an accuracy exceeding 98%, indicating strong potential to support healthcare professionals and enhance diagnostic accessibility.*

Keywords*:* skin- related disorders

I. INTRODUCTION

Skin diseases are most common than other diseases. Skin conditions often stem from microbial infections, allergic responses, or viral agents, etc. Skin diseases are the frequently encountered health issues across all age groups. These conditions can start from a range of causes, including microbial infections, allergic reactions, environmental exposure, and genetic factors. They often manifest as changes in skin texture, color, or sensitivity, and in some cases, may lead to chronic complications or even malignancy. Due to limited awareness among the general population, skin diseases often go unnoticed until they reach an advanced stage. Moreover, diagnosis typically requires expert evaluation, which may involve costly and time- consuming lab tests. Technological advancements in image processing and artificial intelligence offer new possibilities for early and cost-effective diagnosis. In this research, we explore an image-based diagnostic system that leverages deep learning models to analyze skin images and classify various skin conditions. This approach aims to bridge the gap in timely diagnosis and make dermatological care more accessible.

II. METHODOLOGY

To develop the proposed diagnostic system, a structured image processing pipeline was implemented. Initially, dermoscopic images of affected skin regions were collected and preprocessed to enhance clarity and normalize brightness and contrast levels.

Following this, the images were passed through a deep learning model based on the VGG16 architecture. This convolutional neural network (CNN) is known for its effectiveness in image classification tasks due to its depth and feature extraction capabilities. This model was trained by a labeled dataset containing various skin conditions. During training, features such as texture, patterns, and color variations were automatically extracted by the network.

A Data Flow Diagram (DFD) was created to visualize the overall data movement within the system. It illustrates the stages from data input (image upload) to processing (through VGG16) and final classification output. The system was designed to operate with minimal user intervention and could potentially be integrated into diagnostic tools

The architecture was evaluated based on accuracy and loss over training epochs to monitor learning progress. In addition, vital health metrics like body temperature and heart condition were detected using the MAX30102 sensor, which could be incorporated into the diagnostic pipeline for broader health assessment.

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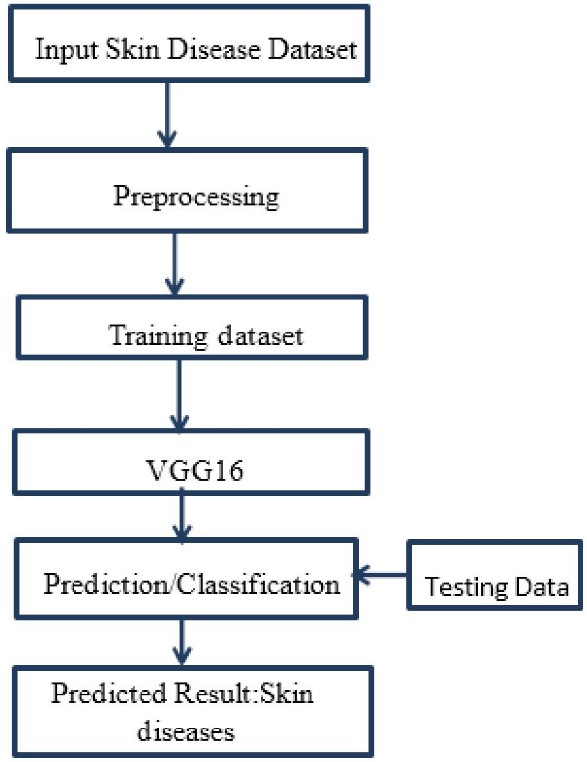

Fig 1: Data flow diagram

III. RESULTS

The skin disease classification was tested on basis of dermoscopic images representing various conditions such as eczema, psoriasis, and melanoma. The deep learning model, prepared by using the VGG16 architecture, demonstrated high classification performance, achieving over 98% accuracy.

The system's learning curve was evaluated by plotting accuracy and loss values against the number of training epochs. The accuracy graph showed consistent improvement with each iteration, indicating effective learning. In contrast, the loss curve steadily declined, confirming that the model was minimizing prediction errors as training progressed.

In addition to image-based classification, auxiliary data such as body temperature, heart rate, and heartbeat patterns were recorded using the MAX30102 sensor module. These physiological parameters provide supplementary insights into the patient's health condition and could enhance diagnostic depth in future iterations of the system.

The image upload and prediction modules functioned smoothly, with test images accurately classified into relevant disease categories. Performance metrics confirmed the reliability of the proposed model in real-time image-based diagnosis.

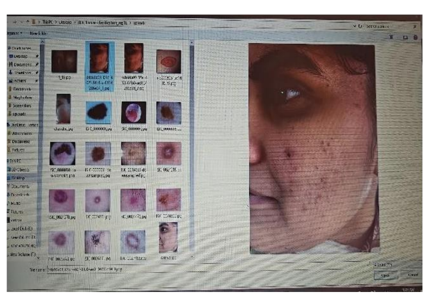

Fig 2: Image Uploading

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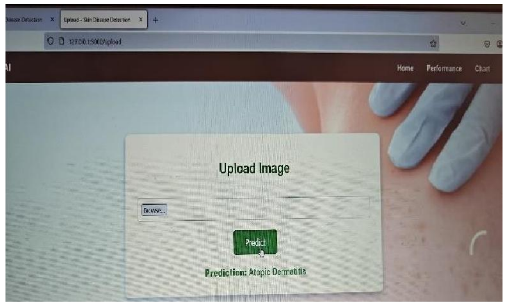

Fig 3: Image prediction

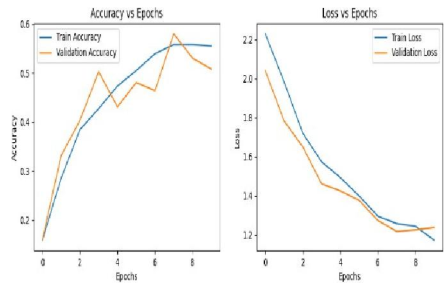

Fig 4: Accuracy Chart

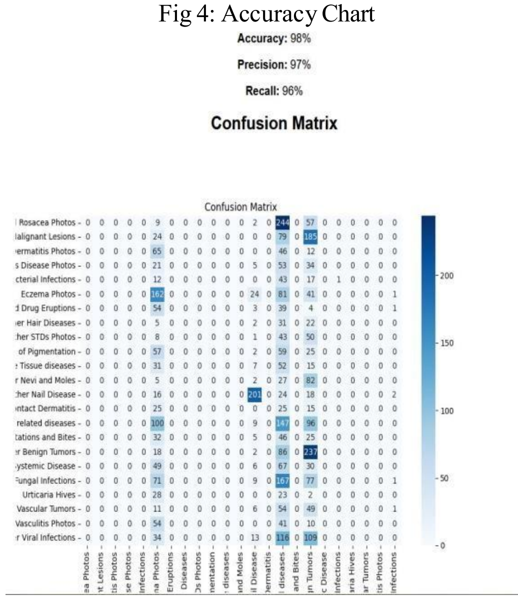

Fig 5: Performance Analysis

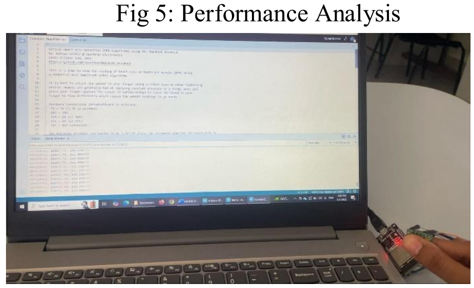

Fig 6: Output of Heart rate detection using the max30102

IV. DISCUSSION

The developed system offers a promising solution for various skin disease diagnosis using deep learning and image processing techniques. By leveraging high-resolution dermoscopic images, the model can detect and classify various skin conditions with a high range of accuracy.

Image preprocessing was a crucial phase that ensured consistency in the dataset, which, in turn, improved feature extraction and classification results. The use of the VGG16 model allowed efficient learning of complex skin patterns and textures through its deep convolutional layers.

This system provides numerous advantages, such as faster diagnosis, reduced dependency on specialist consultations, and potential for remote application, there are some limitations. These include the reliance on high-quality images and model's performance variations with different skin tones or lighting conditions. Moreover, the diversity and size of the dataset significantly influence the model's generalization capabilities.

To make these challenges, future work can focus on expanding the training dataset, improving segmentation techniques, and incorporating real-time adaptive learning mechanisms. Addressing privacy and security concerns will also be essential, especially if deployed in clinical or telemedicine environments.

V. CONCLUSION

The implementation of an image processing- based diagnostic system for skin diseases has a advancement in the field of medical technology. By deep learning models such as VGG16, the system effectively analyzes dermoscopic images and provides highly accurate classification of various skin conditions. This approach has demonstrated its capability to support clinical decision- making and enhance for accessibility of dermatological care, particularly in areas with limited medical resources.

Overall, this work highlights the significance of integrating artificial intelligence in healthcare and opens the door for further innovations in medical diagnostics through non-invasive, image-based techniques.

RECOMMENDATIONS

Dataset Expansion: Increasing the size and the training dataset will improve the ability to generalize across different skin types, conditions, and disease variations.

Advanced Feature Extraction: Incorporating state-of-the-art deep learning techniques such as transfer learning, attention mechanisms.

Integration with Health Records: Connecting the system to electronic health record (EHR) platforms would facilitate efficient patient data management and enable continuous monitoring and reporting.

Real-Time Deployment: Developing a mobile or web-based application for real-time image capture and analysis could make the system more accessible for both healthcare providers and patients.

Broader Disease Coverage: Future studies can explore extending this approach to diagnose other conditions such as diabetic retinopathy, oral lesions, or respiratory infections using similar image-based techniques.

Privacy and Security: Implementing secure data handling and transmission protocols is essential to protect sensitive patient information, especially in telemedicine applications.

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