WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Intelligent System for Skin Disease Prediction using Machine Learning

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ABSTRACT:

Human skin is a vital yet sensitive organ, often affected by a wide range of known and unknown diseases, making diagnosis a complex task. Due to limitations in healthcare infrastructure, many skin conditions remain undetected. To overcome this challenge, this paper presents a Mobile Android Application based solely on the Convolutional Neural Network (CNN) algorithm for accurate skin disease detection. The system was tested on a dataset containing around 3,000 images sourced from institutions such as Beni-Suef University Hospital, Cairo University Hospital, and several verified websites to ensure variety and realism. Extensive experiments were conducted to evaluate the model's performance. The results demonstrate the CNN model's effectiveness in identifying various skin diseases and delivering accurate predictions, along with the disease name and recommended treatment information.

Keywords: CNN,Skin Classification,SVM Classifier

1. INTRODUCTION

Skin-related disorders rank among the most widespread health challenges globally. These conditions range from mild irritations to serious medical concerns and can greatly affect an individual's daily life and overall well-being. Although medical science has made considerable strides, diagnosing skin diseases remains a difficult and often time-intensive process. This complexity is primarily due to the visual similarities between various skin conditions, the shortage of dermatology experts, and the unique ways these diseases manifest across different individuals. Timely and accurate detection is vital for effective treatment; however, in many remote or underserved areas, cases are frequently overlooked or improperly diagnosed due to limited resources.

Recently, machine learning has shown significant promise in transforming medical diagnostics. Its strength lies in processing large volumes of data and identifying hidden patterns, making it especially useful in image-based disease classification tasks. By applying machine learning techniques, it is now possible to design intelligent systems that can detect skin diseases from images with high precision. Such systems can assist medical professionals in making faster and more informed decisions and also act as essential tools in areas where access to healthcare specialists is limited.

This study presents a smart diagnostic system built using machine learning techniques, with a focus on Convolutional Neural Networks (CNN). The model is integrated into an Android-based mobile application that allows users to capture or upload images of skin-affected areas for real-time analysis. Trained on a varied and comprehensive dataset sourced from trusted medical institutions, the system is designed to deliver accurate and consistent predictions in practical settings.

Extensive testing and evaluation confirm the system's ability to correctly identify numerous types of skin diseases and offer users relevant diagnostic feedback, including the name of the condition and suggested treatments. The deployment of this technology through mobile platforms not only increases accessibility to dermatological assessments but also marks a significant advancement in the use of artificial intelligence for improving healthcare delivery.

2. LITERATURE SURVEY

Lama Abdulwahab Dajim [1] 2019 This research introduces a decentralized web-based platform designed for organ donation, built using blockchain technology. The application allows patients to input critical medical data, including their ID, blood type, and required organ information. The allocation process is primarily based on a first-come, first-served basis, but urgent cases are prioritized. The system enhances transparency, security, and fairness in organ distribution.

Gasim Alandjani [2] 2019 With the evolution of the Internet of Things (IoT), machine-to-machine interactions are becoming more common, involving actions such as financial transactions and service automation without direct human control. This paper highlights the risks associated with these autonomous decisions, especially in medical services, and proposes a blockchain-based framework to record and track such actions securely. The

solution ensures data integrity and traceability, fulfilling both technical and legal requirements, while preventing fraudulent activities in organ transplant operations.

Anmol Soni, [3] 2021 Recognizing the urgency involved in finding suitable organ donors, this study presents a blockchain-powered online platform to streamline organ donation. The system follows a FIFO mechanism but also adapts to emergency scenarios by giving higher priority to critical patients. Blockchain's immutable and secure architecture provides confidentiality and authenticity. The application uses smart contracts and RSA encryption for digital verification, eliminating the need for repetitive authentication.

Hau Chan [4] 2020 This paper tackles the manual process of determining whether violent crimes are gang-related by introducing an AI model called Partially Generative Neural Networks (PGNN). The model is capable of making accurate classifications even when some crime-related information is missing. Trained on a dataset from Los Angeles (2014–2016), PGNN outperformed existing models in classifying violent incidents, especially gang-involved ones, even under conditions of incomplete data.

Matthew Valasik [5] 2018 The study explores how Risk Terrain Modeling (RTM) can be employed to predict gang-related violence, particularly assaults and homicides, in specific urban regions. Focusing on the Hollenbeck district of the

LAPD, RTM uses environmental and geographic factors to anticipate where future gang crimes may occur. This predictive method aids law enforcement in allocating resources more effectively and intervening proactively.

3. PROPOSED SYSTEM

This study presents a mobile Android application for skin disease detection developed using a Convolutional Neural Network (CNN) model. To evaluate the performance of the proposed CNN system, several experiments were conducted on a dataset containing approximately 3000 images. These images were collected from diverse sources, including Beni-Suef University Hospital, Cairo University Hospital, and various online platforms, ensuring both accuracy and diversity. The model was trained to extract features and classify different types of skin conditions directly through the CNN architecture. The results demonstrated that the CNN-based system effectively identifies various skin diseases and provides users with the disease name along with corresponding treatment suggestions, offering high accuracy and practical utility.

4. Architecture Diagram

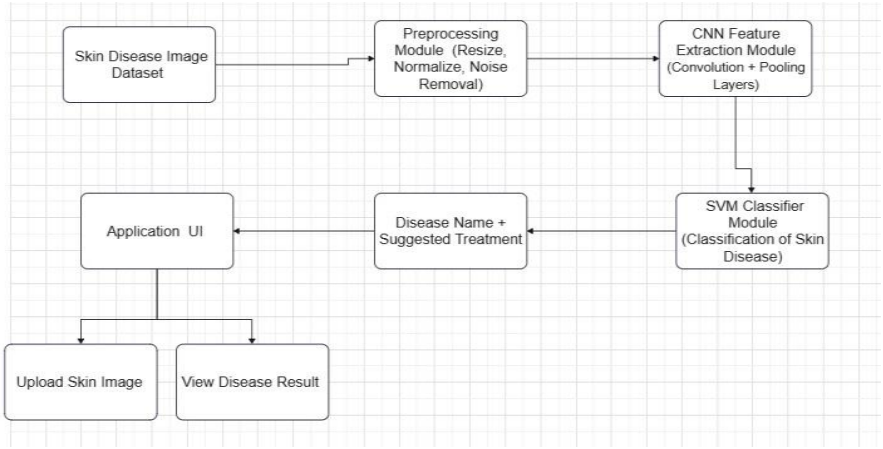

Fig 1: Architecture Diagram

5. MODULES

5.1 User Interface Module

This module serves as the front-facing layer of the web application, allowing users to interact with the system through a clean, user-friendly interface. Users can upload skin images via a web form, view analysis results, and receive disease predictions with associated treatment information. The frontend is built using modern web technologies such as HTML5, CSS3, and JavaScript (or frameworks like React/Angular, based on implementation). It ensures cross-browser compatibility, mobile responsiveness, and secure data input from the user.

5.2 Image Preprocessing Module

Before feeding the image to the CNN model, this module handles the standardization and enhancement of input images. It includes several steps like resizing the image to a fixed resolution, converting color channels to standard formats (such as RGB), normalization of pixel values between 0 and 1,

and removing unwanted noise. These preprocessing steps ensure consistent input to the model and enhance the accuracy of feature detection. Tools like OpenCV or Pillow can be used in the backend for processing the image.

5.3 Feature Extraction using CNN (Convolutional Neural Network)

This module is responsible for automatically extracting meaningful patterns from skin images using a deep learning architecture, specifically CNN. It uses convolutional layers, pooling layers, and activation functions (ReLU) to detect visual features such as texture, edges, and color gradients. These features represent the visual signature of different skin conditions. CNN significantly reduces the need for manual feature engineering and improves recognition performance. The model is trained on a large dataset of skin disease images and validated using test data to ensure generalization.

5.4 Classification Module

The features obtained from the CNN model are forwarded to the fully connected (dense) layers, which act as classifiers. Based on the training, the model predicts the category of skin disease by comparing image features against known labeled patterns. The classifier uses softmax or sigmoid activation (depending on the number of classes) to produce probability scores for each disease class. The disease with the highest probability is selected as the final prediction. The system may include diseases like eczema, psoriasis, acne, ringworm, etc.

5.5 Result Display and Treatment Recommendation Module

After classification, the final result is sent back to the web interface and displayed to the user. This module shows the predicted disease name, a confidence percentage, and treatment suggestions. Treatment data is curated from verified dermatology sources and includes basic steps, preventive care, and medication (if applicable). It also encourages the user to consult a medical professional for a more detailed examination. The result is presented clearly, along with links or downloads (if enabled) for treatment guidance.

6. CONCLUSION

The accurate identification of skin diseases plays a crucial role in preventing their spread and ensuring timely medical intervention. The developed system offers a cost-effective and accessible solution for early diagnosis, significantly reducing delays in treatment. By leveraging a modified pre-trained Convolutional Neural Network (CNN) the system efficiently detects various skin conditions. This innovation is particularly impactful for rural and underserved areas in India, where medical infrastructure remains limited. Early detection through this mobile-based application can aid in curbing the transmission of contagious skin diseases, promoting better healthcare outcomes and minimizing the burden on existing medical resources.

7. RESULT

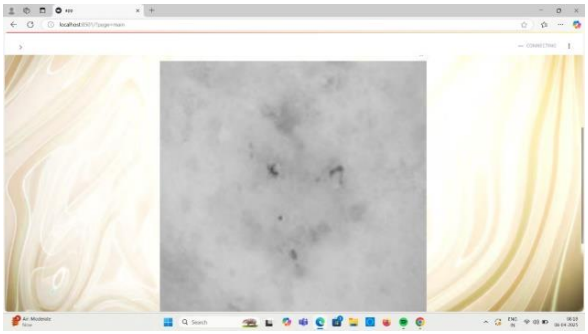

Fig: 1 Input image

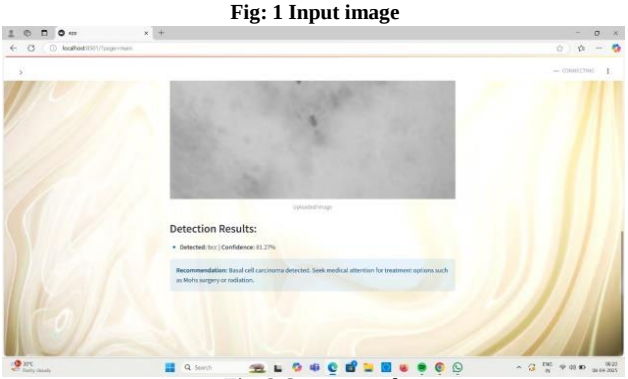

Fig: 2 Output result

8. FUTURE SCOPE

The proposed web-based skin disease prediction system holds significant potential for future enhancements. One promising direction is the integration of a larger and more diverse dataset to improve the accuracy and reliability of the predictions across various skin tones and conditions. Additionally, the system can be extended to support multilingual interfaces, making it accessible to users from different regions and backgrounds.

9. REFERENCE

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