Grenze International Journal of Engineering and Technology, June Issue

Skin Disease Detection using AI and Deep Learning Techniques

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***Abstract*— In the recent years, As the technology is rising, the development in the healthcare sector is also increasing by using technology like AI (Artificial intelligence) that transformed the healthcare system completely which create and implacable impact in the individual's life related which also provide comfort of early disease identification and treatment. This study presents an AI-Based Skin Disease Detection System that allows users to upload images of damaged skin texture, color, and patterns using Convolutional Neural Networks (CNN) and transfer learning techniques, correctly recognizing probable ailments such as eczema, psoriasis, and acne. This system is distinguished itself by providing the feature that it also detects the, Indian and darker skin tone which make this system unique and outstanding. This model also supports in bilingual language in Hindi /English, it provides doctor consultation support, it also stores record of the patient activity etc. As the primary goal of the system is to make dermatological consultant accessible to everywhere and trustworthy, reliable platform using technology like AI and Deep-learning.**

***Keywords*— CNN (Convolutional Neural Networks), AI (Artificial intelligence), DP (Deep learning).**

I. INTRODUCTION

As the human's are interactive to the technology in there daily routines the health related issues are also increase and most common health issues are observed are related to the skin .skin issues are the most common health concern for an individuals which affect million of people irrespective of there ages, gender and regions .early detections of any disease can help people to cure complication .but the problem not just solved by early detection of disease after detection of the disease the guidance of an dermatological expertise is also creates an great impact in the case of skin disease but unfortunately the guidance of an expert derma is not easily available everywhere such as in the developing country like India. So as the technology improving itself with the use of AI and deep learning so by using this technology in healthcare the skin disease diagnosis also present a transformative possibility to automate the healthcare sector. However The prior work which has been done in this area has lack of transparency and most of them are biased towards the western skin tone, and mostly are available in English language. To solve this problem this study presents a AI-based Skin Disease Detection system which provide transparency, and real-world applicability. In this system the user or the patient uploads a photograph of their damaged skin, after the model use algorithms like (CNN) Convolutional Neural Networks and after the processing it determines the disease.

Grenze ID: 01.GIJET.12.2.71_20

This model just not prediction the disease it also explain the reason for predicting that disease this model is also work for Indian and darker skin tone to ensure fairness and region –specific accuracy. This platform also provide the bilingual support (Hindi/English), and privacy by design principles, which provide user low maintenance cost and access of effect environment. Additional features such as doctor suggestion based on patients requirements, it also monitoring the trends, To conclude all this basically this system is not just using AI in prediction of diseases, but it also help patient so take their healthcare system online which helps them in finding better options for the problem, make easy for them to consent with the dermat for their problem.

II. Literature Review

This research describes an AI-based system for detecting skin disorders, which includes picture preprocessing, feature extraction, and illness classification using models such as CNNs, Transfer Learning, and GANs. Using databases such as HAM10000 and Dermnet NZ improves accuracy across several skin tones. The study assesses performance parameters like sensitivity and ROC-AUC for clinical dependability while also addressing issues such as data imbalance and ethical considerations. It suggests future integration of multimodal data and the development of explainable AI for clinician trust, as well as collaboration among AI researchers, clinicians, and policymakers to ensure ethical AI use in healthcare [1]. This systematic review looks at the use of AI techniques, specifically ML and deep learning, to classify skin illnesses, with a focus on skin cancer diagnosis. It examines 56 peer-reviewed articles out of a total of 220, with an emphasis on AI models employed with dermatological pictures. CNN has been recognized as the most effective way, with over 90% accuracy, but novel approaches utilizing Transformer and hybrid models are emerging. This system faces difficulty in differences in dataset; no new information about the skin type it works has the AI models because we don't know how it comes to the output, and this is because it is not trustworthy by the users. In future research it also focuses on dataset diversity based on different parameters like age, gender, etc. And work on improving model and try to make it practical in real life [2]. This study works with the help of machine learning and deep learning typr of technology for finding the solution of skin related issues like eczema, acne, and melanoma. This study mainly focuses on tell that how the technology like AI, and Dl method like CNN provide better detection of skin related diseases, to prove their point in this this research include comparison between different type of techniques based on their performance ,this study emphasis the techniques such as Generative Adversarial Networks (GANs) and also on diversity in dataset . In the future, it will work on AI explanation and cloud-based detection [3].This research shows how the traditional methods are not effective in the comparison of time and techniques also for problems related to skin disease and also how the new systems are depend on the work of the AI/DL and Watershed, Otsu Thresholding, K-Means, and Fuzzy C-Means and these are the methods to find the infected area image and for future extraction AlexNet, GoogleNet, and ResNet50 these are some techniques of Dl will be used and this research also test some classification models like SVM, CNN, and ensemble methods, achieving 60–96% accuracy. This system is accessible by different devices and it is fully depend on AI.It conclude the overall need of diverse dataset, good processing and connected with AI for better results in pateient health[4].

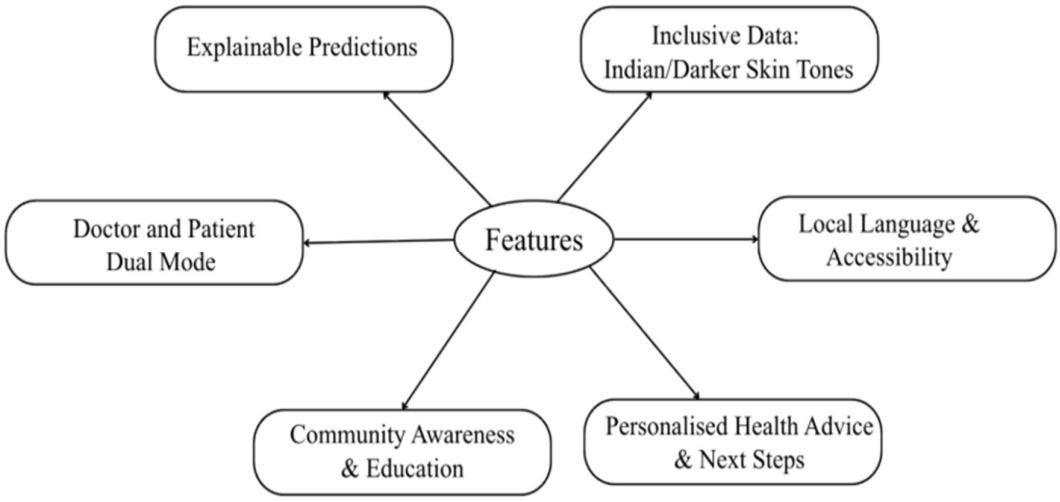

Figure 1. Features of Skins disease

TABLE I: COMPARATIVE STUDY OF EXISTING

S. No	Year	Methodology	Limitation
1	2024	This system uses a CNN-based ML/DL model to predict the skin disease, then provides explainable results with advice of doctors and also track the activity of user.	It has poor and imbalanced dataset so that is can be give the inaccurate result. And it has privacy issues also.
2	2024	This is system it selected the 56 paper from different sites like IEEE and analyze them based on ML and deep learning.	It has lack of accuracy and explainability and it suffers from dataset bias or annotations error.
3	2024	This model analyzes the different machine learning techniques like CNN, SVM, KNN, GAN'S attention models,etc by comparing on the basis of their architectures, datasets, and performance for skin disease detection.	This model struggle due lack of dataset, poor quality of image and finding difficulty in the Generalizing in different skin tone. And also facing problem in real world problems.
4	2022	This model study about the different – different techniques of ML and DL which are used in skin disease detection .	This model finds difficulty in finding accuracy, low-quality of images, varying performance in different skin tone.

III. METHODOLOGY

- User Upload Skin Image: This system take Input as the user upload the picture of affected skin area by using any device. After uploading the image system will ensure that image is clear or not .After figure out the image next step will start.
- Image processing: once the patient upload the image system will automatically done the work like (resize, enchancing the quality of image) and anonymize the sensitive regions due to privacy concern.
- Machine learning /deep learning predict CNN Model: This is the step where main business logic resides of the system for the accurate analysis of result the system is segmented using methods like region growing.
- Explainable output: In this system user not only get the result of the prediction but also the explainable reason by the system predict that result. And also show that which region of the uploaded image help to taken the decision.
- Display Result: This system now shows that what is the current condition of your skin care, and also care advice to the user according to the result like what is the basic routine of skin care, if major disease is detected then how to deal with that and all possible advices which is require for the patient to improve his/her current condition.
- Doctor consult: After provide result there is the next option for the user is that he/she may want to consult with the doctor or not. This option is also available but system will only go for this option if patient required it.
- Chat/video consultation: If user want to consult with the doctor then user also have option to choose the mode by (chat or video consultation) which user can consult with the doctor.
- Store/trace dairy log: It also store the track record of user activity. It mean basically all the things which is done by the user in system will get saved automatically and help users to view there history as per their requirement.

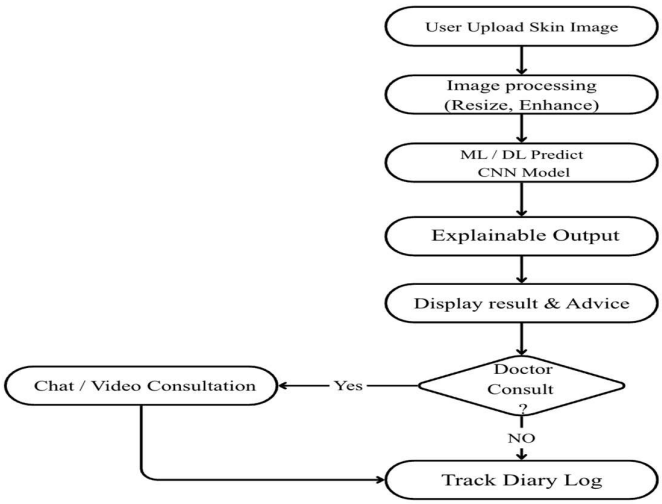

Figure 2: Proposed Methodology

IV. RESULT

Hear we analyze the performance of some models which are used for Skin Disease Detection on the basis of their Parameters and this model Ensemble CNN+SVM has the highest accuracy as 93% where others are also computationally efficient.

TABLE II: PARAMETER TO CLASSIFY THE MODEL

Model	Accuracy	Precision	Recall
CNN	86	84	83
MObileNetV3	89	87	86
EfficientNEt-B0	91	90	89
ResNet50	88	86	85
Ensemble CNN+SVM	93	92	91

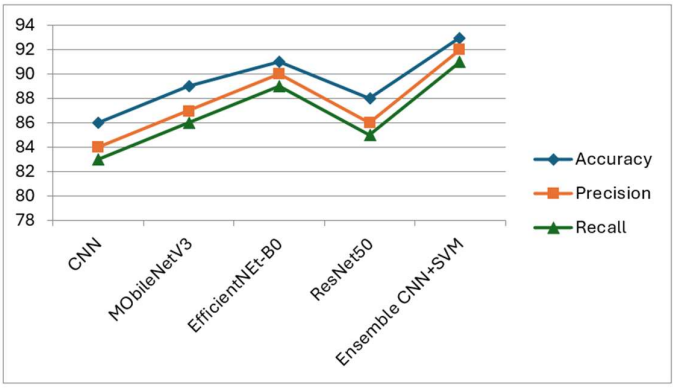

Figure 3. Different Algorithms Line chart

The above tabular data and Line chart shows the performance of different models to detect skin disease in percentage value. Overall the data shows that the proposed system is accurate, reliable and practical for real world medical use.

V. CONCLUSION

AI-Based Skin Disease Detection System detect the skin disease automatically and used Deep learning models for detect the disease from image and explainable AI to know about the disease and it also has Indian skin tone data to give fair and accurate result.

FUTURE SCOPE

It can be more accurate and fast by intregating the new AI technology, mobile apps and cloud system in future.

- By imporving the dataset it can store and detect the more diseases
- It can work on multiple skin tones.
- By using the advanced AI models it detect the disease by video based checking or 3D akin scanning.
- All features can be implemented in a single app in offline mode

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