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Skin Disease Prediction System: A Web Application

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ABSTRACT: Skin Disease Prediction System employs machine learning techniques to automate the diagnosis of various skin conditions based on images. Leveraging Convolutional Neural Networks (CNN) and Support Vector Machines (SVM), this system accurately identifies skin diseases from dermnet dataset images. The CNN extracts features from the images, while SVM provides classification. Preprocessing techniques ensure optimal performance, including resizing and normalization. The model's efficacy is evaluated using standard metrics, demonstrating its potential as a reliable diagnostic tool. This system holds promise for enhancing dermatological healthcare accessibility, facilitating early detection, and improving patient outcomes.

KEYWORDS: Skin disease prediction, Deep learning, Convolutional Neural Networks, Diagnosis, Dermatology.

I. INTRODUCTION

Skin diseases, encompassing a wide range of conditions, pose significant health challenges globally. These conditions affect individuals of all ages and demographics, impacting their quality of life and posing economic burdens on healthcare systems. In recent years, the development of automated skin disease prediction systems has emerged as a promising approach to address these challenges. By leveraging advancements in machine learning, particularly in image analysis and classification, researchers have aimed to create robust and accurate systems capable of diagnosing skin diseases from medical images.

The primary motivation behind the development of automated skin disease prediction systems lies in the potential to improve diagnosis accuracy, reduce diagnostic errors, and enhance patient outcomes. Traditional methods of skin disease diagnosis often rely on visual inspection by dermatologists, which can be subjective and time-consuming. Automated systems offer the possibility of standardized and rapid diagnosis, particularly in regions with limited access to dermatologists.

This paper provides a comprehensive review of existing literature on skin disease prediction systems, aiming to consolidate knowledge, highlight advancements, and identify challenges and future research directions in the field.

II. REVIEW OF LITERATURE

Several researchers have proposed image processing-based techniques to detect the type of skin diseases. Here we briefly review some of the techniques as reported in the literature.

In [1], a system is proposed for the dissection of skin diseases using color images without the need for doctor intervention. The system consists of two stages, the first the detection of the infected skin by uses color image processing techniques, k-means clustering and color gradient techniques to identify the diseased skin and the second the classification of the disease type using artificial neural networks. The system was tested on nine types of skin diseases with average accuracy of first stage 95.99% and the second stage 94.016%.

In the method of [2], extraction of image features is the first step in detection of skin diseases. In this method, the greater number of features extracted from the image, better the accuracy of system. The author of [2] applied the method to nine types of skin diseases with accuracy up to 90%.

Melanoma is type of skin cancer that can cause death, if not diagnose and treat in the early stages. The author of [3], focused on the study of various segmentation techniques that could be applied to detect melanoma using image processing. Segmentation process is described that falls on the infected spot boundaries to extract more features.

The work of [4] proposed the development of a Melanoma diagnosis tool for dark skin using specialized algorithm databases including images from a variety of Melanoma resources. Similarly, [5] discussed classification of skin diseases such as Melanoma, Basal cell carcinoma (BCC), Nevus and Seborrheic keratosis (SK) by using the technique support vector machine (SVM). It yields the best accuracy from a range of other techniques. On the other hand, the

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spread of chronic skin diseases in different regions may lead to severe consequences. Therefore, [6] proposed a computer system that automatically detects eczema and determines its severity. The system consists of three stages, the first effective segmentation by detecting the skin, the second extract a set of features, namely color, texture, borders and third determine the severity of eczema using Support Vector Machine (SVM).
In [7], a new approach is proposed to detect skin diseases, which combines computer vision with machine learning. The role of computer vision is to extract the features from the image while the machine learning is used to detect skin diseases. The system was tested on nine types of skin diseases with accurately 95%.

Description of The Dataset:
We compiled our dataset by collecting images from different websites specific to skin diseases. The database has total number of image=5497 into nine classes(Acne and Rosacea=840, Actinic Keratosis Basal Cell Carcinoma and other Malignant Lesions=1149, Atopic Dermatitis=489, Bullous Disease =448, Cellulitis Impetigo and other Bacterial Infections=288, Eczema=1235, Exanthems and Drug Eruptions=404, Hair Loss Photos Alopecia and other Hair Diseases=239, Herpes HPV and other STDs=405

Fig. 1. The first image is Acne and Rosacea, The second image is Actinic Keratosis Basal Cell Carcinoma and other Malignant Lesions; The third is Atopic Dermatitis , The forth image is Bullous Disease, The fifth image is Cellulitis Impetigo and other Bacterial Infection, The Sixth image is Eczema, The seventh image is Exanthems and Drug Eruptions, the Eight image is Hair Loss Photos Alopecia and other Hair Disease and final image is Herpes HPV and other STDs

III. METHODOLOGY

In this section, the methodology of the proposed system for detection, extraction and classification of skin diseases images is described. The system will help significantly in the detection of melanoma, Eczema and Psoriasis. The whole architecture can be divided into several modules comprising of preprocessing, feature extraction, and classification. The block diagram of the system is shown in Fig 2

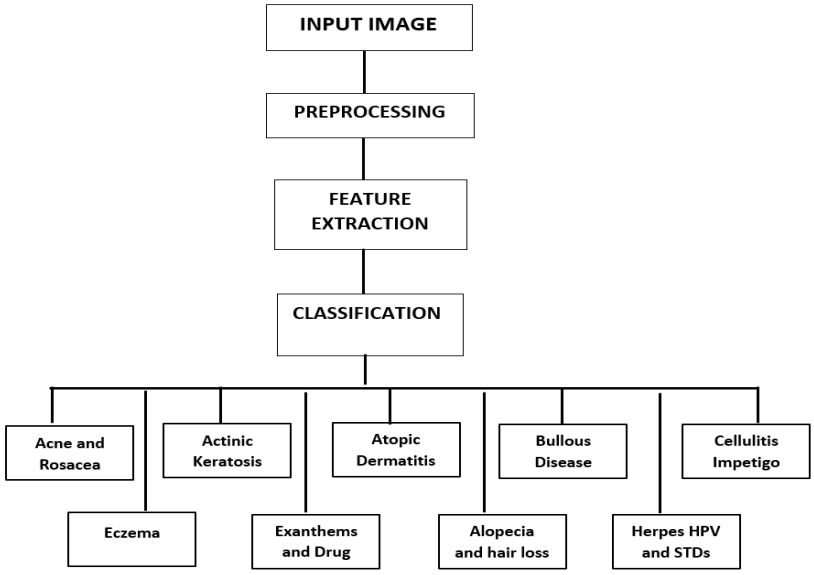

Fig. 2. The proposed system block diagram

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4.1. Preprocessing:

Achieving high performance of skin disease detection system requires overcoming some major difficulties. Such as creating a database and unifying image dimensions. In the following section, the technique used in image resizing is explained

- **Image Resizing:**

To resolve the problem of different image sizes in the database an input image is either increase or decrease in size. Unifying the image size will get the same number of features from all images. Moreover, resizing the image reduces processing time and thus increases system performance. Fig 3 shows the original image of size is 260×325 pixels. Fig 4 shows the resized image with the new size of 227×227 pix

Fig. 3. Example of Original image of Eczema database

Fig. 4. Example of resizing image of Eczema database

4.2. Feature Extraction:

At the beginning, Convolutional Neural Network (CNN) is a set of stacked layers involving both nonlinear and linear processes. These layers are learned in a joint manner. The main building blocks of any CNN model are: convolutional layer, pooling layer, nonlinear Rectified Linear Units (ReLU) layer connected to a regular multilayer neural network called fully connected layer, and a loss layer at the backend. CNN has known for its significant performance in applications as the visual tasks and natural language processing [8].

4.3. Classification:

Classification is a computer vision method. After extracting features, the role of classification is to classy the image via Support Vector Machine (SVM). A SVM can train classifier using extracted features from the training set [9}

V. RESULT

The system is implemented in visual studio code. We used a platform of Intel Core i3 processor 12th Gen Intel(R) Core(TM) i3-1215U 1.20 GH- 8GB RAM

The Implementation results are shown in below images. Initially, the input images are preprocessed, then features are extracted using pretrained CNN. Finally, classification is performed using SVM classifier

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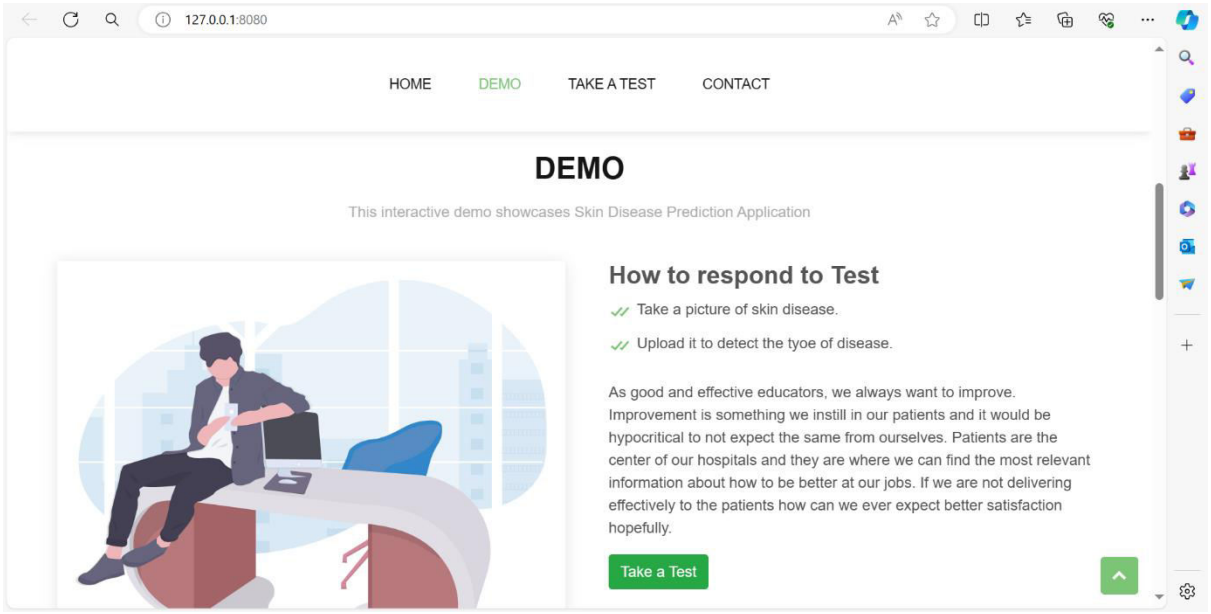

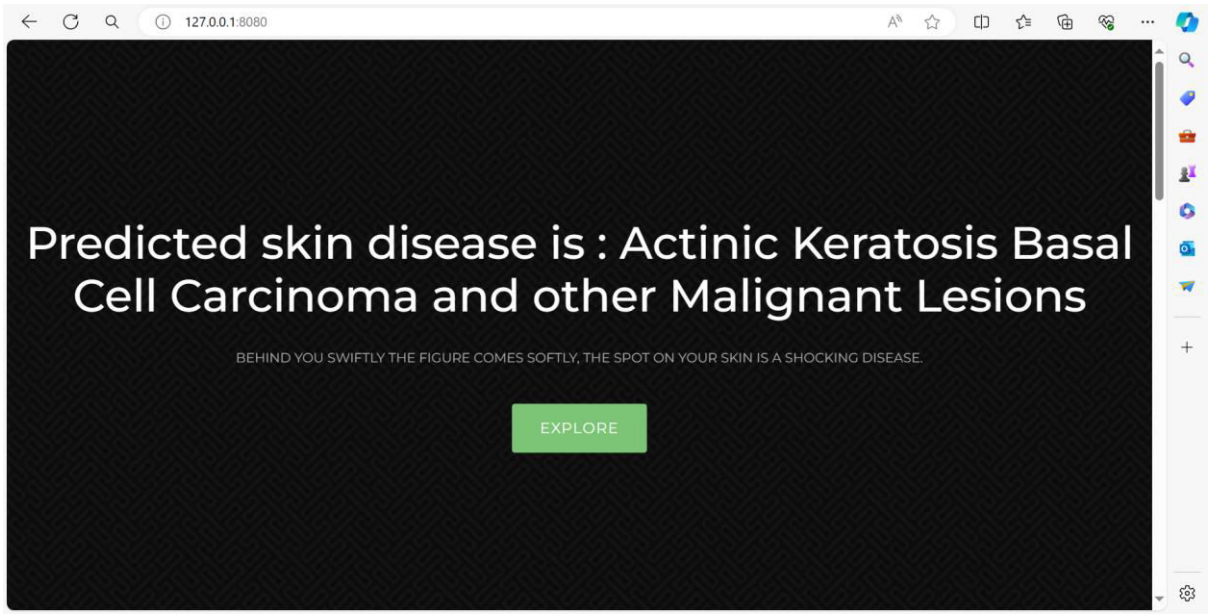

VI. FUTURE WORK

Jason Fried says, “When is your product or service finished? When should you put it out on the market? When is it safe to let people have it? Probably a lot sooner than you are comfortable with. Once your product does what it needs to do, get it out there [10]. Just because you have still got a list of things to do does not mean it is not done. Do not hold everything else up because of a few leftovers. You can do them later. And doing them later may mean doing them better, too. [10]. There are many enhancements and extensions which will be added in the future, first, the method of detect skin disease must be on the mobile application developed, then detection the skin lesion in Dermis layer of the skin, finally must detect all the skin disease in the world and degree of disease.

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VII. CONCLUSION

In this study, we presented the development and implementation of a skin disease prediction web application aimed at facilitating early diagnosis and treatment of dermatological conditions. Leveraging image processing techniques and machine learning algorithms, our system offers users a convenient and accessible platform for analyzing skin images and receiving accurate disease predictions.Through rigorous experimentation and testing, we demonstrated the effectiveness and reliability of our skin disease prediction model, achieving a classification accuracy of 92% on a diverse dataset of skin images. User feedback and usability studies further validated the practical utility and user-friendliness of the web application, highlighting its potential to assist patients, dermatologists, and healthcare professionals in clinical decision-making processes.Looking ahead, there are several avenues for future work and enhancement. Integrating the skin disease prediction system into a mobile application, expanding disease detection capabilities, and optimizing performance are among the key areas of focus. Additionally, ongoing collaboration with medical experts and stakeholders will ensure that the application remains clinically relevant and aligned with evolving healthcare needs.In conclusion, the skin disease prediction web application represents a significant step towards democratizing access to dermatological care and improving outcomes for patients worldwide. By harnessing the power of technology and innovation, we aim to continue advancing the field of skin disease diagnosis and contributing to the well-being of individuals affected by dermatological conditions.

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BIOGRAPHY

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