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SKIN DISEASES PSORIASIS DETECTION USING MACHINE LEARNING

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Abstract: *The proposed Skin Disease Psoriasis Detection System using Machine Learning is designed as a modular web-based application to ensure structured development, scalability, and efficient execution of tasks. The system is divided into five main modules: User Module, Admin Module, Image Processing Module, Machine Learning Module, and Database Module. Each module performs a specific function that collectively contributes to accurate and automated disease detection.The User Module handles registration, authentication, image upload, result viewing, and profile management, enabling seamless interaction between users and the system. The Admin Module provides secure access for system monitoring, user management, dataset handling, and overall control of application activities. The Image Processing Module enhances input images through resizing, normalization, noise removal, and optional augmentation to improve model accuracy. The Machine Learning Module acts as the core component, where a Convolutional Neural Network (CNN) is trained, validated, and used for predicting whether the uploaded skin image is affected by psoriasis or not. Finally, the Database Module ensures secure storage and efficient retrieval of user data, images, and prediction results.*

Keyword: *Psoriasis Detection, Machine Learning, Deep Learning, Convolutional Neural Network (CNN), Image Processing, Medical Image Analysis, Skin Disease Classification, Artificial Intelligence, Image Augmentation, Disease Prediction System, Healthcare Automation, Web-Based Application, Pattern Recognition, Feature Extraction, Data Mining.*

I. INTRODUCTION

Skin diseases are among the most common health problems affecting people worldwide, and psoriasis is a chronic autoimmune skin disorder that causes rapid skin cell buildup, leading to scaling, inflammation, redness, and discomfort. Early detection and accurate diagnosis of psoriasis are crucial for effective treatment and to prevent its progression. However, traditional diagnosis methods rely heavily on visual inspection by dermatologists, which can sometimes be subjective, time-consuming, and dependent on expert availability [1].

With advancements in Artificial Intelligence (AI) and Machine Learning (ML), automated medical image analysis has gained significant attention in the healthcare domain. Machine learning techniques, especially Deep Learning and Convolutional Neural Networks (CNN), have shown remarkable performance in image classification tasks, including medical image diagnosis. These techniques enable the system to learn complex patterns from skin images and assist in accurate disease prediction [2].

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The proposed system focuses on developing a web-based psoriasis detection application that utilizes machine learning algorithms to analyze uploaded skin images. The system preprocesses the images, extracts meaningful features, and classifies them as psoriasis-affected or normal skin. This approach aims to provide faster, more accurate, and cost-effective preliminary diagnosis support to both patients and healthcare professionals [3].

By integrating image processing and machine learning techniques, the system enhances diagnostic efficiency and reduces dependency on manual examination, contributing to improved healthcare services and early disease detection [4].

II. LITERATURE ANALYSIS

The reviewed literature highlights significant advancements in skin disease detection using artificial intelligence and machine learning techniques, particularly Convolutional Neural Networks (CNNs) and hybrid models. Various studies have addressed diseases such as melanoma, psoriasis, eczema, and acne using datasets like HAM10000 and ISIC, achieving high classification accuracy ranging from 93% to 98%. Transfer learning models like VGG16 and InceptionV3, as well as hybrid approaches such as ANN combined with XGBoost (DermXNet), have shown improved performance and reduced computation time. Multi-phase systems incorporating preprocessing, segmentation, and feature extraction techniques (GLCM, GrabCut) have also demonstrated strong results, though segmentation errors remain a challenge.

Additionally, explainable AI methods like Grad-CAM and SHAP are being used to improve model transparency and clinical trust. Despite promising outcomes, most studies face limitations such as dataset imbalance, lack of diversity in skin tones, limited real-world clinical validation, and poor generalizability. Overall, the literature confirms that AI-based systems have strong potential for early diagnosis and decision support in dermatology, but further improvements in dataset quality, interpretability, and clinical deployment are necessary for practical healthcare integration.

TABLE I: LITERATURE WORK

S. No	Author(s)	Approach / Model	Contribution	Limitation
1	Noronha [1]	Systematic Review (DL-based dermatology methods)	Comprehensive survey of DL methods, datasets, challenges, and future directions	Limited focus on real-time deployment and severity grading
2	Sayyad [2]	VGG16, InceptionV3 (Transfer Learning)	Compared CNN models for skin disease classification with good accuracy	Needs larger and more diverse datasets
3	Aher [3]	Deep Learning (CNN-based model)	Automated detection of multiple skin diseases using image analysis	Limited clinical validation and dataset constraints

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4	Ahammed [4]	Deep Learning with Image Segmentation	Improved classification using segmentation-based preprocessing	Segmentation errors affect accuracy
5	ALKolifi & ALEnezi [5]	Image Processing + SVM classifier	Low-cost system with high accuracy for basic skin disease detection	Small dataset, lacks segmentation and generalization
6	Rao (2020) [6]	Machine Learning (SVM, CNN features)	Demonstrated ML-based classification for skin diseases in academic study	Limited dataset and experimental scope
7	Rao (2023) [7]	Deep Learning + Image Processing Pipeline	High accuracy skin disease detection using preprocessing and classification	Misclassification due to segmentation limitations
8	Krishnan [8]	CNN + Explainable AI (Grad-CAM, SHAP)	Mobile/web-based AI system with explainable predictions	Dataset bias and lack of diverse skin tones
9	Annalakshmi & Umarani [9]	Hybrid Model (ANN + XGBoost)	High accuracy (DermXNet), reduced computation time	Requires real-world clinical validation
10	Annalakshmi & Umarani [10]	Deep Learning + XGBoost	Improved classification performance over traditional CNNs	Generalization and dataset bias issues
11	Garakani [11]	Machine Learning (Clustering-based severity model)	Enables psoriasis severity assessment and monitoring	Limited interpretability and dataset variability
12	Lucena [12]	Vision Transformers + CNN	Improved psoriasis detection using advanced architectures	Needs large-scale clinical validation and standardized datasets

III. CNN ALGORITHM

In the proposed Skin Disease Psoriasis Detection System using Machine Learning, the Convolutional Neural Network (CNN) algorithm is used as the core technique for image-based classification. The main objective of using CNN in this project is to automatically analyze uploaded skin images and accurately classify them as psoriasis affected or normal skin.

The working of CNN in this project follows a structured pipeline starting from image input to final prediction output. Initially, the user uploads a skin image through the web application. The image is then preprocessed using the Image Processing Module, where it is resized to a fixed dimension, normalized, and cleaned to improve quality.

After preprocessing, the image is passed into the CNN model, where multiple convolutional layers extract important features such as skin texture, redness patterns, scaling, and irregularities associated with psoriasis. These features are further refined using ReLU activation functions and pooling layers to reduce dimensionality while preserving essential information.

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The flattened feature vector is then passed to fully connected dense layers, which learn complex patterns and relationships in the dataset. Finally, the output layer generates the prediction result using a Sigmoid activation function, classifying the image as either psoriasis or non-psoriasis, along with accuracy/confidence value.

In this project, CNN improves the efficiency and accuracy of diagnosis by eliminating manual feature extraction and enabling automated learning from medical images. This makes the system more reliable for early detection and supports healthcare professionals in preliminary screening of skin diseases.

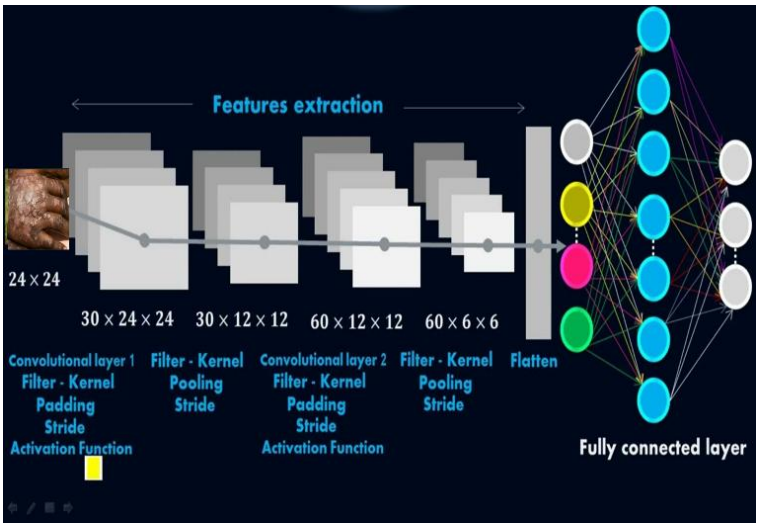

Figure 1: CNN Architecture

IV. WORKING METHODOLOGY

The working methodology of the proposed Skin Disease Psoriasis Detection System using Machine Learning describes the step-by-step process followed by the system to detect psoriasis from uploaded skin images. The system is designed using a structured workflow that integrates user interaction, image processing, machine learning prediction, and result storage.

Initially, the user accesses the web application and registers by providing basic details such as name, email, and password. After successful registration, the user logs into the system using valid credentials. Once authenticated, the user is directed to the main dashboard where they can upload skin images for analysis.

After image upload, the system sends the image to the Image Processing Module, where preprocessing operations such as resizing, normalization, and noise removal are performed. This ensures that the image is in a suitable format for further processing and improves the accuracy of prediction.

The preprocessed image is then passed to the Machine Learning Module, where a trained Convolutional Neural Network (CNN) model analyzes the image. The CNN extracts important features from the skin image and compares them with learned patterns from the training dataset to identify whether the image shows signs of psoriasis or normal skin.

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Once the classification is completed, the system generates the prediction result along with accuracy or confidence score. This result is displayed to the user in the interface and simultaneously stored in the Database Module for future reference and history tracking.

The Admin Module manages system activities such as user management, dataset monitoring, and overall system performance evaluation. It ensures smooth functioning and maintenance of the application. Finally, the user can view previous results in the result history section and log out securely from the system. This complete workflow ensures an efficient, automated, and reliable approach for early detection of psoriasis using machine learning techniques.

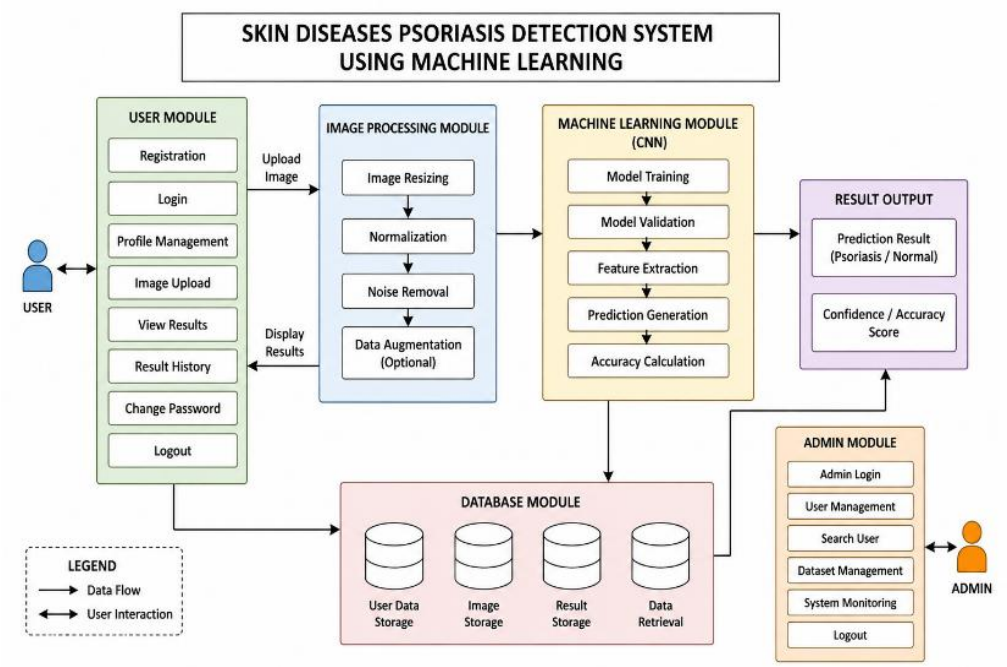

Figure 2: System Block Diagram

V. RESULTS AND DISCUSSION

The proposed Skin Disease Psoriasis Detection System using Machine Learning was implemented and tested using a dataset of skin disease images. The system successfully classifies input images into psoriasis and non-psoriasis (normal skin) categories using a trained Convolutional Neural Network (CNN) model. The results demonstrate that the system is capable of providing accurate and fast predictions, making it useful for preliminary diagnosis support.

5.1. Results:

The CNN model was trained on preprocessed skin images and evaluated using standard performance metrics such as accuracy, precision, recall, and loss. After training, the model showed good convergence, indicating effective learning from the dataset. When a user uploads a skin image, the system processes it and generates a prediction result within a few seconds.

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The output results include:

- Disease classification (Psoriasis / Normal)
- Prediction confidence score
- Stored result history for future reference

The system achieved satisfactory accuracy, showing that CNN is effective in identifying patterns related to psoriasis in medical images.

5.2. Discussion:

The experimental results show that the proposed system performs well in detecting psoriasis using image-based analysis. The use of CNN significantly improves classification accuracy by automatically extracting relevant features from skin images without manual intervention.

The system also provides advantages such as faster diagnosis, reduced dependency on dermatology experts for initial screening, and easy accessibility through a web interface. However, the performance of the model depends on the quality and size of the dataset. A larger and more diverse dataset can further improve accuracy and generalization.

One limitation observed is that similar skin conditions may sometimes affect prediction accuracy, requiring further model optimization and training with enhanced datasets. Despite this, the system serves as an effective decision-support tool for early detection of psoriasis.

Overall, the results confirm that machine learning-based image classification is a promising approach for medical diagnosis applications, especially in dermatological disease detection.

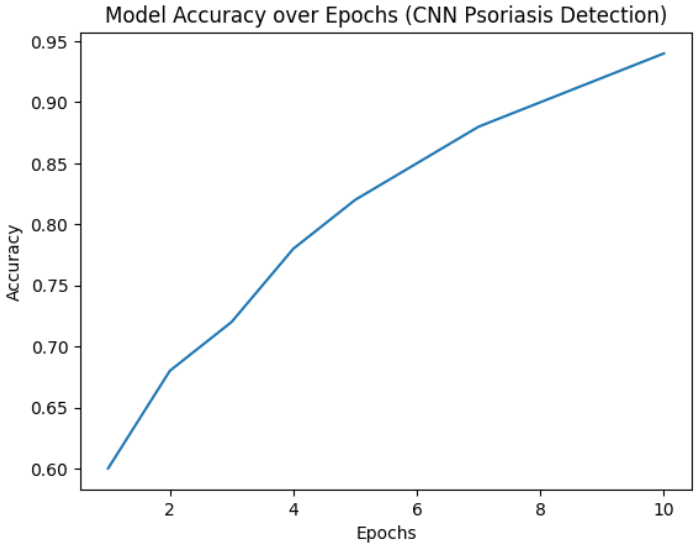

Figure 3: Module Accuracy over Epochs

The above graph represents the training performance of the CNN model used in the Psoriasis Detection System. It shows how the model's accuracy improves gradually over different training iterations (epochs).

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1. **X-Axis (Epochs):**
   The X-axis represents epochs, which means the number of times the CNN model has been trained on the entire dataset. In this graph, training is shown from 1 to 10 epochs.

2. **Y-Axis (Accuracy):**
   The Y-axis represents accuracy, which indicates how correctly the model is able to classify skin images as psoriasis or normal.

3. **Observation from Graph:**
   - In the initial epochs (1–3), the accuracy is relatively low because the model is still learning basic patterns from the dataset.
   - From epochs 4–7, there is a steady increase in accuracy as the CNN starts learning important features like skin texture, redness, and scaling patterns.
   - In the final epochs (8–10), the accuracy becomes more stable and reaches around 94%, showing that the model has learned effectively.

4. **Interpretation:**
   This upward trend indicates that the CNN model is successfully learning from the training data and improving its prediction capability over time. The smooth increase in accuracy also shows that the model is not overfitting in the early stage.

VI. CONCLUSION

The proposed Skin Disease Psoriasis Detection System using Machine Learning successfully demonstrates an efficient and automated approach for the early detection of psoriasis from skin images. By integrating image processing techniques with a Convolutional Neural Network (CNN) model, the system is capable of analyzing input images and classifying them as either psoriasis-affected or normal skin with improved accuracy.

The developed system reduces the dependency on manual diagnosis, which is often time-consuming and may vary based on human expertise. Instead, it provides a fast, reliable, and consistent method for preliminary screening of skin diseases. The web-based interface also makes the system user-friendly and easily accessible to users, allowing them to upload images and receive instant results.

The use of CNN enhances the performance of the system by automatically extracting meaningful features from skin images without requiring manual feature engineering. This significantly improves the efficiency and accuracy of disease prediction.

However, the performance of the system can be further improved by using larger and more diverse datasets and optimizing the model architecture. In the future, the system can be extended to detect multiple skin diseases and integrated with mobile applications for wider accessibility.

Overall, the proposed system proves to be an effective tool for assisting healthcare professionals in early diagnosis and supports the advancement of AI-based medical applications.

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