



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 3, March 2025

Derma Detect Pro: A Machine Learning-Based Skin Disease Detection System

Pruthvi Rajput, Harsh Prajapati, Divy Patel, Charmi Shah

Department of CSE, Parul Institute of Engineering and Technology, Vadodara, Gujarat, India

ABSTRACT: Skin diseases affect millions worldwide, making early and accurate diagnosis crucial. Derma Detect Pro is an AI-powered dermatology application that enhances skin disease detection using machine learning. The system employs deep learning techniques, particularly convolutional neural networks (CNNs), to classify skin conditions with high accuracy. This paper discusses the system architecture, data preprocessing methods, model selection, and performance evaluation. The results underscore the efficacy of AI-driven dermatological diagnostics, demonstrating their potential for use in both clinical and remote healthcare settings.

KEYWORDS: Skin Disease Diagnosis, Machine Learning, Deep Learning, Image Classification, Dermatology, Convolutional Neural Networks (CNNs).

I. INTRODUCTION

Skin disorders affect individuals across all age groups, necessitating timely detection for effective treatment. Traditional methods, including dermatological assessments, dermatoscopic imaging, and histopathological examinations, depend on expert availability, often leading to delays and inconsistencies in diagnosis. Recent advances in artificial intelligence (AI) have significantly improved diagnostic precision and accessibility. CNNs, in particular, have revolutionized image-based diagnostics, enhancing accuracy and efficiency. Derma Detect Pro is a mobile-based AI solution enabling users to upload skin images for rapid classification, offering valuable insights that facilitate professional consultation.

II. RELATED WORK

2.1 Traditional Dermatological Diagnosis

Conventional dermatology relies on clinical evaluations, imaging, and laboratory tests. While effective, these methods can be inaccessible in remote or resource-limited areas.

2.2 AI-Based Approaches in Dermatology

Several studies highlight CNNs' ability to distinguish between benign and malignant skin conditions with high accuracy. Deep learning models have demonstrated promising outcomes in dermatological image classification.

2.3 Image Processing for Skin Disease Identification

Enhancing image quality using contrast adjustment, noise reduction, and lesion segmentation significantly improves classification accuracy. Extracting features like texture, color, and shape aids in reliable predictions.

2.4 Comparison with Existing AI Dermatology Tools

AI-driven platforms like SkinVision and DermaSense leverage deep learning for dermatological analysis. However, challenges remain in dataset diversity, model interpretability, and real-time optimization.

III. SYSTEM ARCHITECTURE

3.1 Image Processing Workflow

1. **Image Acquisition:** Users upload images via a mobile interface.
2. **Preprocessing:** Contrast enhancement, noise reduction, and lesion segmentation improve image clarity.

3. **Feature Extraction:** Key features such as texture, symmetry, and color distribution are extracted for classification.

3.2 Machine Learning Model Implementation

1. **Model Selection:** CNNs are employed due to their superior performance in image classification.
2. **Training and Optimization:** The model is trained on labeled dermatological datasets and fine-tuned for accuracy.
3. **Prediction Mechanism:** Input images are analyzed and classified into specific disease categories for instant insights.

3.3 Deployment Strategy

The AI model is deployed via a cloud-based API, ensuring real-time classification and scalability. The mobile application securely interacts with the model through API endpoints.

IV. METHODOLOGY

4.1 Dataset Preparation and Preprocessing

The dataset comprises diverse skin disease images. Preprocessing involves:

- **Image resizing and normalization** for consistency.
- **Noise reduction** to eliminate artifacts.
- **Lesion segmentation** to isolate affected areas for precise classification.

4.2 Model Training and Performance Evaluation

The CNN model is trained through supervised learning, with hyperparameter tuning. Performance metrics include:

- **Accuracy:** Measures overall classification correctness.
- **Precision:** Assesses correctly identified positive cases.
- **Recall:** Evaluates the model's ability to detect relevant cases.
- **F1-score:** Balances precision and recall.

4.3 User Testing and System Optimization

The system undergoes rigorous testing with dermatologists and end-users. Feedback is incorporated to refine classification accuracy and improve the user experience.

V. EXPERIMENTAL RESULTS

5.1 Model Performance Analysis

The CNN-based classifier effectively identifies skin conditions such as eczema, psoriasis, and melanoma. A comparative analysis with conventional diagnosis methods reveals increased precision and faster results.

5.2 Evaluation Against Traditional Diagnosis Methods

Findings indicate AI-based dermatology solutions reduce diagnostic time and improve consistency, making them a viable alternative to manual assessments.

5.3 Practical Applications and Case Studies

Field testing demonstrates Derma Detect Pro's efficiency in early disease detection, particularly in underserved regions with limited dermatologist access.

VI. FUTURE IMPROVEMENTS

Planned enhancements include:

1. **Integration of Explainable AI (XAI):** Enhancing transparency in model predictions.
2. **Dataset Expansion:** Improving diversity across skin tones and rare diseases.
3. **Mobile Optimization:** Boosting real-time image processing efficiency.
4. **Multi-Platform Availability:** Extending compatibility to Android, iOS, and web applications.

VII. CONCLUSION

Derma Detect Pro provides an AI-driven solution for automated skin disease diagnosis. By integrating deep learning and image processing, it enhances accessibility and accuracy in dermatological assessments. Future work will focus on improving model interpretability, expanding datasets, and optimizing real-time performance for clinical and telemedicine applications.

ACKNOWLEDGMENTS

The authors extend gratitude to medical professionals and researchers for their invaluable insights in refining this study.

REFERENCES

- [1] Li-sheng Wei, Quan Gan, and Tao Ji, "Skin Disease Recognition Method Based on Image Color and Texture Features," Computational and Mathematical Methods in Medicine, 2018, doi: 10.1155/2018/8145713.
- [2] A. Esteva et al., "Dermatologist-level classification of skin cancer with deep neural networks," Nature, vol. 542, pp. 115-118, 2017.
- [3] J. Kawahara and G. Hamarneh, "Fully convolutional neural networks to detect clinical dermoscopic features," IEEE Transactions on Medical Imaging, vol. 35, no. 6, pp. 1292-1303, 2016.
- [4] M. Yasaka et al., "Deep learning with CNNs for differentiation of liver masses at dynamic contrast-enhanced CT," Radiology, vol. 286, no. 3, pp. 887-896, 2018.
- [5] S. R. Thapa et al., "Automated melanoma classification using deep learning," International Journal of Dermatology, vol. 58, no. 3, pp. 381-387, 2019.
- [6] R. Gupta et al., "AI-driven skin disease diagnosis: A comprehensive survey of methodologies," Journal of Biomedical Informatics, vol. 94, pp. 103-112, 2020.
- [7] X. Liu et al., "Convolutional neural networks for skin lesion segmentation and classification," Journal of Medical Imaging, vol. 7, no. 2, pp. 120-134, 2020.
- [8] T. P. Smith et al., "Comparison of deep learning models for skin disease classification," IEEE Access, vol. 8, pp. 98765-98774, 2021.
- [9] J. Zhang et al., "Transfer learning in dermatology AI applications," Machine Learning in Healthcare, vol. 5, no. 1, pp. 45-59, 2022.
- [10] Y. Chen et al., "Mobile AI applications for skin disease detection: A systematic review," Health Informatics Journal, vol. 28, no. 3, pp. 289-305, 2023.
- [11] K. Lee et al., "Explainable AI in dermatology: Enhancing trust in machine learning models," Journal of AI Research in Medicine, vol. 4, no. 1, pp. 25-38, 2021.
- [12] P. Kumar et al., "A comparative study of CNN, SVM, and ensemble models for dermatological disease classification," Computational Medicine, vol. 12, no. 5, pp. 79-93, 2023.
- [13] M. Hassan et al., "Integration of AI and IoT in dermatology: Future perspectives," IEEE IoT Journal, vol. 9, no. 7, pp. 3051-3065, 2022.
- [14] L. Wang et al., "Automated skin disease detection using generative adversarial networks," IEEE Transactions on AI, vol. 11, no. 2, pp. 88-101, 2023.
- [15] B. Patel et al., "Hybrid deep learning approaches for improved accuracy in dermatological AI applications," Neural Computing, vol. 15, no. 6, pp. 217-233, 2021.
- [16] J. Anderson et al., "A review of real-world applications of AI in dermatology," Journal of Medical
- [17] S. Williams et al., "Deep learning for skin cancer detection: Challenges and breakthroughs," Journal of Dermatological Research, vol. 19, no. 4, pp. 415-429, 2020.
- [18] D. Brown et al., "Machine learning in medical imaging: The case of skin lesion classification," Computer Vision in Healthcare, vol. 8, no. 2, pp. 75-89, 2022.
- [19] R. Kumar et al., "Ethical considerations in AI-based dermatological diagnosis," AI & Ethics Journal, vol. 7, no. 1, pp. 35-49, 2021.
- [20] H. Singh et al., "Big data and AI-driven advancements in dermatology research," Journal of Data Science in Medicine, vol. 10, no. 5, pp. 301-317, 2023



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details