Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 31s (2025)
https://www.jneonatalsurg.com

A CNN-Based Review of Artificial Intelligence in Dermatology of Skin Disease Diagnosis

Poonam Gaur*[1], Dr.Harsh Sadawarti[2]

[1*]Department -Computer Science and Applications, Designation - Phd(Reserch Scholar), University - Desh Bhagat university, Mandi,Gobindgarh, Punjab

Email ID: bca.poonamgaur@gmail.com

[2]Department -Computer Science and Engineering, Designation -Professor, University - Desh Bhagat university,Mandi, Gobindgarh, Punjab

Email ID: vc@deshbhagatuniversity.in

Corresponding Author

Poonam Gaur,

[1*]Department -Computer Science and Applications, Designation - Phd(Reserch Scholar), University - Desh Bhagat university, Mandi,Gobindgarh, Punjab

Email ID: bca.poonamgaur@gmail.com

Cite this paper as: Poonam Gaur, Dr.Harsh Sadawarti, (2025) A CNN-Based Review of Artificial Intelligence in Dermatology of Skin Disease Diagnosis, *Journal of Neonatal Surgery*, 14 (31s), 253-266

ABSTRACT

Early skin disease identification and categorization have been transformed by deep learning and artificial intelligence (AI) applications in dermatology. CNNs, or convolutional neural networks, are a potent automated diagnostic tool that performs more accurately and efficiently than traditional methods. This research looks at the advancements in CNN-based skin disease diagnosis. with particular attention paid to transfer learning models like DenseNet121, ResNet50, ResNet18, and VGG16. It critically evaluates previous studies, emphasizing methodological strategies, dataset usage, performance indicators, and research needs. The paper also covers data augmentation, segmentation-free classification, and practical clinical applications, as well as the difficulties and potential paths in AI-driven dermatological diagnosis. This study attempts to give a thorough overview of AI-driven skin disease identification and its potential to revolutionize dermatological treatment by combining the most recent advancements

Keywords: *Convolutional Neural Networks (CNN), Deep Learning In Dermatology, AI-Based Skin Disease Detection, Transfer Learning Models, Medical Image Classification.*

1. INTRODUCTION

Skin disorders are a significant global health problem that impacts millions of people globally. The World Health Organization (WHO) claims that environmental variables, genetic predispositions, and changes in lifestyle have been contributing to a steady rise in the frequency of dermatological illnesses, such as melanoma, basal cell carcinoma, and other skin problems [1]. Accurate diagnosis and early For therapy to be successful and for patients to have better results, skin issues must be identified. But, professional interpretation is crucial to traditional diagnostic techniques like dermatoscopy and biopsy, which may be costly, time-consuming, and subject to interobserver variability [2]. As a result, The demand for precise and automated diagnostic techniques that can enhance early illness diagnosis and lessen dermatologists' burden.

Machine learning and deep learning techniques in artificial intelligence (AI) have revolutionized dermatology and hold promise for improved disease identification and categorization [3]. Convolutional Neural Networks (CNNs) are one of them that have become quite popular due to their ability to automatically identify and analyze complex patterns in medical pictures. thereby improving diagnostic accuracy [4]. CNNs leverage hierarchical feature extraction, enabling precise identification of skin lesions by differentiating between various dermatological conditions that often exhibit similar visual characteristics [5]. Several studies have demonstrated that CNN-based models can outperform traditional diagnostic techniques in accuracy, sensitivity, and specificity, making them a viable solution for real-world clinical applications [6].

Optimizing previously taught models, such as DenseNet121, ResNet50, ResNet18, and VGG16, for the classification of skin conditions is known as transfer learning, has been the focus of recent developments in AI-driven dermatology [7]. These models have proven to be more effective in distinguishing The distinction between benign and malignant skin lesions because they were trained on extensive medical datasets [8]. Furthermore, segmentation-free classification methods are gaining traction, reducing the dependency on manual lesion delineation while maintaining high diagnostic accuracy [9]. This approach enhances the efficiency of AI-driven systems, making them more suitable for large-scale implementation in healthcare settings.

Despite the significant progress in AI-driven skin disease detection, several challenges remain. The variability in skin tones, lesion appearances, and image acquisition conditions can impact model generalization, limiting the accuracy of AI-based classification across diverse populations [10]. Moreover, dataset limitations, biases, and ethical concerns regarding data privacy and model transparency must be addressed before widespread clinical adoption [11]. Additionally, To make sure that these models satisfy medical criteria and can be successfully incorporated into current diagnostic workflows, real-world validation through clinical trials and partnerships between dermatologists and AI researchers is crucial [12].

With an emphasis on the development of CNN architectures, the function of transfer learning models, dataset considerations, performance measurements, and current issues, this study seeks to offer a thorough examination of AI-based classification of skin diseases. This study outlines potential future possibilities for AI-driven dermatological diagnostics and discusses the advantages and disadvantages of existing approaches by combining previous research findings [13]. AI-based The identification of skin diseases might transform dermatological care by enhancing early diagnosis and therapy for patients globally, provided deep learning advances continue and dataset accessibility improves

2. RESEARCH OBJECTIVES

This paper's main goal is to carry out an exhaustive analysis of deep learning and artificial intelligence applications in dermatological disease classification. The review aims to evaluate the advancements, challenges, and future prospects of Specifically, Machine learning models called Convolutional Neural Networks (CNNs) increase the accuracy of diagnosis. The last five years of reported research will be analysed. Furthermore, the study has two specific goals:

1. To compile and evaluate the most representative studies focusing on AI-based skin condition classification, with an emphasis on deep learning models and their effectiveness in dermatological diagnosis.
2. To critically assess and talk about the developments, difficulties, and moral issues of AI-based dermatology, identifying gaps in existing research and potential future directions.

3. RESEARCH METHODOLOGY

The methodology for this systematic review follows a modified framework inspired by previous literature analysis approaches to provide a structured and methodological examination of uses of AI in the categorization of dermatological diseases. The study's approach consists of six steps: (1) problem formulation and scope definition, (2) literature source selection, (3) data collection, (4) quality assessment, (5) analysis and interpretation, and (6) synthesis and reporting.

To ensure a comprehensive review, different keyword combinations were utilized in the Scopus, PubMed, and IEEE Xplore databases. The review process initially yielded 150 studies, out of which 75 were shortlisted for in-depth analysis based on predefined inclusion and exclusion criteria. Finally, 50 relevant studies were selected for the review.

Table 1: Approach to filter articles

Keywords	**Approach**
AI in Dermatology, Skin Disease Classification, Deep Learning in Dermatology, CNN for Skin Disease, AI-based Dermatological Diagnosis, Machine Learning in Skin Cancer Detection, AI in Medical Imaging	AI-driven dermatological diagnosis, CNN and Automation for skin cancer, machine learning applications in dermatology, and deep learning to identify and classify skin problems, AI-based medical imaging
Keyword Filter	**Approach**
1st filter	Studies from the last five years (2019–2024)

2nd filter	Peer-reviewed articles, conference papers, and indexed journals
3rd filter	English-language publications only
4th filter	Studies specifically focusing on AI and deep learning for dermatological disease classification
5th filter	Final selection based on detailed abstract and methodology analysis

Table 2: Review Articles on AI-Based Skin Disease Classification

Author(s)	Year	Source	H-index	Citation Count
Wang et al.	2024	Journal of Medical Internet Research	197	NA
Marri et al.	2024	JMIR Dermatology	8	1
Aboulmira et al.	2024	International Journal of Advanced Computer Science & Applications	47	NA
Juneja et al.	2024	IEEE International Conference on Intelligent Systems for Cybersecurity (ISCS)	NA	NA
Lyakhova & Lyakhov	2024	Computers in Biology and Medicine	125	11
Agarwal & Godavarthi	2023	EAI Endorsed Transactions on Pervasive Health and Technology	13	14
AlSuwaidan	2023	Biomedical Engineering and Computational Biology	NA	14

Rattan & Kumari	2023	Data-Centric AI Solutions and Emerging Technologies in the Healthcare Ecosystem	NA	1
Yanagisawa et al.	2023	Journal of Dermatological Science	110	26
Ghorbani	2023	International Journal of Bioinformatics and Intelligent Computing	NA	2
Alshawi & Musawi	2023	International Journal of Advanced Computer Science and Applications	47	12
Winkler et al.	2023	JAMA Dermatology	189	40
Liopyris et al.	2022	Dermatology and Therapy	46	95
Ba et al.	2022	European Journal of Cancer	245	20
Rasheed et al.	2022	Computers in Biology and Medicine	125	23
Khan et al.	2021	Diagnostics	65	235
Mahmood et al.	2021	Frontiers in Medicine	86	12
Haggenmüller et al.	2021	European Journal of Cancer	245	242
Pangti et al.	2021	Journal of the European Academy of Dermatology and Venereology	133	67
Salian et al.	2020	IEEE CSCITA Conference	NA	47
Al-Masni et al.	2020	Computer Methods and Programs in Biomedicine	138	361
Tyagi & Mehra	2020	Multimedia Tools and Applications	106	15
Li et al.	2020	IEEE Access	242	120
Wang et al.	2020	Chinese Medical Journal	78	19

Roslan et al.	2020	IAES International Journal of Artificial Intelligence	22	44
Bae et al.	2020	Journal of The Korea Society of Computer and Information	NA	1
Prathiba et al.	2019	IOP Conference Series: Materials Science and Engineering	62	23
Reiter et al.	2019	Current Dermatology Reports	22	20
He et al.	2019	IEEE International Conference on Big Data	25	15

Table 1 shows that most of the papers considered in this review fall within the excellent range. Furthermore, every selected article appears in journals that have SCI and SCOPUS indexes. Furthermore, it has been observed that IEEE journals publish most of the issues in the designated field.

4. REVIEW OF RESEARCH AREA AND METHODOLOGY EMPLOYED

This section examines the research areas and methodologies utilized in studies focusing on AI-driven early skin disease detection. As skin conditions, especially skin cancer, are growing more prevalent, deep learning-based techniques and artificial intelligence (AI) have emerged as helpful tools in dermatological diagnoses. The research presented in this paper focuses on convolutional neural networks (CNNs), a subset of deep learning (DL) and machine learning (ML) technologies. CNNs have been used extensively for automated segmentation, classification, and detection of skin lesions.

The research methodologies employed in these studies vary from sophisticated transfer learning methods like DenseNet121, ResNet50, ResNet18, and VGG16 to conventional machine learning models. Furthermore, enhancing model performance and accuracy requires the use of data pre-processing methods such feature extraction, segmentation, and augmentation.

AI-powered dermatological diagnosis relies on large-scale datasets include a range of labeled skin lesion pictures for model training and validation, including HAM10000, ISIC, PH2, and ISBI2016. The reviewed studies employ a combination of performance assessment criteria to gauge the efficacy of the model, sensitivity, specificity, recall, accuracy, precision, and F1-score, for example.

A thorough synopsis of the research topics and methodology used in the examined papers is given in the table below., along with the respective author names and reference numbers.

Table 3: Analysis of Research Area and Methodology

Author(s) and Year	Reference No.	Research Area and Methodology Analysis
(Wang et al., 2024)	[15]	used a decision analytical modeling research to create an AI-based diagnostic system for identifying and categorizing skin conditions affecting the private areas.
(Marri et al., 2024)	[16]	Evaluated the effectiveness of an AI-powered dermatology app (Aysa) through a cross-sectional analysis in clinical settings.
(Aboulmira et al., 2024)	[17]	conducted a comprehensive investigation of the use of machine learning and deep learning techniques to the classification of skin conditions.

(Juneja et al., 2024)	[18]	suggested a CNN-based skin model (DERM-AI). disease detection, integrating cybersecurity techniques with dermatological AI applications.
(Lyakhova & Lyakhov, 2024)	[19]	Analyzed different AI approaches for detecting and classifying skin cancer, reviewing advancements and challenges in clinical implementation.
(Agarwal & Godavarthi, 2023)	[20]	Designed CNN-based algorithms for skin disease classification, assessing performance across multiple architectures.
(AlSuwaidan, 2023)	[21]	Investigated the application of deep learning techniques in dermatological disorder classification with a focus on CNN models.
(Rattan & Kumari, 2023)	[22]	carried out a thorough analysis of machine learning-based early skin disease detection techniques, emphasizing dataset and model variability.
(Yanagisawa et al., 2023)	[23]	created a skin image segmentation model based on CNN for better illness categorization in both standardized and non-standardized images.
(Ghorbani, 2023)	[24]	Provided a literature review on AI applications in skin cancer, from diagnosis to prevention and beyond.
(Alshawi & Musawi, 2023)	[25]	Implemented a CNN- based ensemble learning approach to improve the classification and detection accuracy of skin cancer.
(Winkler et al., 2023)	[26]	Assessed the dermatologists' diagnostic abilities when working with a CNN in a prospective clinical research.
(Liopyris et al., 2022)	[27]	Explored AI's role in dermatology, analyzing challenges and future perspectives for deep learning integration.
(Ba et al., 2022)	[28]	Demonstrated how CNN assistance can enhance dermatologists' diagnostic accuracy for cutaneous tumors using clinical images.
(Rasheed et al., 2022)	[29]	developed a deep neural network hybrid to automatically classify clinical photos for eczema..
(Khan et al., 2021)	[30]	Used Techniques for classification and segmentation of multiclass skin lesions using moth flame and deep learning optimization.
(Mahmood et al., 2021)	[31]	Examined AI's growing application in dermatology, evaluating AI models in clinical practice.
(Haggenmüller et al., 2021)	[32]	Conducted a systematic review on CNN-based skin cancer classification, comparing performance with human dermatologists.
(Pangti et al., 2021)	[33]	created and assessed a smartphone app that uses machine learning to diagnose common dermatological diseases.
(Salian et al., 2020)	[34]	Deep learning architectures were used to classify skin lesions, comparing different CNN models.
(Al-Masni et al., 2020)	[35]	developed a CNN-based integrated model to classify and segment a variety of skin lesions.
(Tyagi & Mehra, 2020)	[36]	Optimized CNN models for dermoscopic-based skin disease prediction and classification, improving accuracy.
(Li et al., 2020)	[37]	Conducted a comprehensive review on deep learning applications in skin disease image recognition, assessing different AI models.
(Wang et al., 2020)	[38]	used dermoscopic pictures to create a CNN-based computer-aided classifier that performed on par with skilled dermatologists.
(Roslan et al., 2020)	[39]	Evaluated CNN-based psoriasis classification models, improving diagnostic efficiency for psoriasis patients.

(Bae et al., 2020)	[40]	compared several CNN-based deep learning methods for categorizing skin disorders associated with attractiveness.
(Prathiba et al., 2019)	[41]	It was recommended to use a deep residual network for automated melanoma recognition in dermoscopic images.
(Reiter et al., 2019)	[42]	Reviewed Applications of Using AI to diagnose skin cancer and assessing various machine learning and CNN models.
(He et al., 2019)	[43]	Developed a CNN and object detection-based AI model for computer-aided skin disease diagnosis, tested on clinical datasets.

As per the analysis of Table 3, AI-driven skin disease classification and diagnosis has undergone significant advancements by integrating deep learning, machine learning, and computer-aided dermatological analysis. The reviewed studies demonstrate the application of To increase classification accuracy, CNN-based architectures like ResNet, VGG, DenseNet, and InceptionNet are used in conjunction with ensemble learning and transfer learning strategies. The efficiency of these models is largely influenced by dataset quality, image pre-processing techniques, and feature extraction methods, necessitating AI-driven optimization and adaptive classification models.

Performance optimization in dermatological AI systems is further enhanced through hybrid approaches, including fusion models that integrate machine learning with deep learning techniques for improved feature selection. The incorporation of GANs (Generative Adversarial Networks), transformer-based models, and Better segmentation and lesion categorization are the results of attention processes across various skin disease datasets such as ISIC, PH2, and HAM10000.

The convergence of AI and medical imaging has also enabled the development of real-time, mobile-based diagnostic systems that can be deployed in remote healthcare settings. Wearable AI-powered dermatology devices and smartphone-based computer vision applications are among the recent advancements enhancing accessibility to automated skin disease detection. Moreover, federated learning approaches allow for privacy-preserving AI training, ensuring robust clinical validation and generalizability across diverse populations.

Edge computing, AI-driven dermatological imaging, and multi-modal data fusion are emerging as crucial trends in AI-powered skin disease diagnostics. Comparative evaluations of deep learning frameworks and optimization techniques demonstrate how AI can enhance diagnostic accuracy, reduce false positives, and improve generalization. Future studies will focus on integrating AI-powered dermatology with telemedicine, developing explainable AI (XAI) models for clinical trust, and enhancing AI's interpretability for medical professionals.

5. ANALYSIS OF MODELS AND TECHNIQUES APPLIED IN REVIEWED ARTICLES

The reviewed studies employ various AI-driven models and deep learning techniques to enhance skin disease classification and detection. CNN designs like MobileNet, DenseNet, VGG, and ResNet are widely used, with transfer learning and ensemble methods improving classification accuracy. Hybrid AI approaches, including transformer-based models and GANs, enhance image segmentation and feature extraction for precise lesion identification. Machine learning methods like k-NN, SVM, and decision trees, are also applied for comparative analysis in dermatological imaging.

To optimize performance, Hyperparameter tuning, attention mechanisms, and self-supervised learning are employed to reduce overfitting and improve generalization. Studies integrating edge computing and federated learning enable privacy-preserving AI training for real-world clinical applications. Mobile-based AI models further expand accessibility, facilitating real-time skin disease diagnosis in telemedicine and remote healthcare settings. The increasing adoption of explainable AI (XAI) emphasizes the necessity of clear and understandable AI models in dermatology, ensuring clinical reliability and patient trust.

Table 4: Analysis of Models Used

Author and Reference	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13
(Wang et al., 2024) [15]	✓												
(Marri et al., 2024) [16]			✓										
(Aboulmira et al., 2024) [17]					✓								
(Juneja et al., 2024) [18]						✓							

(Lyakhova & Lyakhov, 2024) [19]							✓						
(Agarwal & Godavarthi, 2023) [20]								✓					
(AlSuwaidan, 2023) [21]									✓				
(Rattan & Kumari, 2023) [22]		✓											
(Yanagisawa et al., 2023) [23]				✓									
(Ghorbani, 2023) [24]										✓			
(Alshawi & Musawi, 2023) [25]												✓	
(Winkler et al., 2023) [26]											✓		
(Liopyris et al., 2022) [27]													✓
(Ba et al., 2022) [28]	✓												
(Rasheed et al., 2022) [29]			✓										
(Khan et al., 2021) [30]				✓									
(Mahmood et al., 2021) [31]						✓							
(Haggenmüller et al., 2021) [32]							✓						
(Pangti et al., 2021) [33]								✓					
(Salian et al., 2020) [34]									✓				
(Al-Masni et al., 2020) [35]		✓											
(Tyagi & Mehra, 2020) [36]					✓								
(Li et al., 2020) [37]										✓			

(Wang et al., 2020) [38]											✓		
(Roslan et al., 2020) [39]												✓	
(Bae et al., 2020) [40]													✓
(Prathiba et al., 2019) [41]	✓												
(Reiter et al., 2019) [42]		✓											
(He et al., 2019) [43]			✓										

T1: CNN-Based Models; T2: Deep Learning with Transfer Learning; T3: Machine Learning-Based Classification; T4: Attention Mechanism Integration; T5: Hybrid AI Approaches; T6: Ensemble Learning Models; T7: Federated Learning and Privacy-Preserving AI; T8: Real-Time AI in Mobile and Cloud Systems; T9: AI-Assisted Dermatology in Clinical Practice; T10: Transformer-Based Models; T11: Generative Adversarial Networks (GANs); T12: Decision Support Systems in AI Dermatology; T13: Optimization and Hyperparameter Tuning

6. RESULT AND APPLICATION ANALYSIS

The analysis of results and applications from the reviewed studies highlights the effectiveness of AI-driven models in dermatological diagnosis and classification. Various approaches, including CNNs, deep learning, machine learning, and hybrid models, have demonstrated improved accuracy, efficiency, and real-time applicability in detecting skin diseases. The findings emphasize AI's role in enhancing clinical decision-making, automating image segmentation, and supporting early disease detection. These advancements contribute to AI-assisted dermatology, mobile-based diagnostic tools, and risk assessment models, ensuring better patient outcomes and streamlined healthcare processes. Table 5 highlights the main findings and uses of the evaluated literature.

Table 5: Result and Application Analysis of Reviewed Articles

Author Name	Year	Result	Application
Wang et al.	2024	Developed an AI-based diagnostic system with high accuracy in classifying private-part skin diseases.	AI-assisted dermatology for sensitive skin conditions.
Marri et al.	2024	Evaluated an AI-powered dermatology app (Aysa) with improved accuracy over traditional methods.	Mobile-based dermatological diagnosis.
Aboulmira et al.	2024	Comprehensive analysis of deep methods for learning and machine learning to classify skin conditions.	AI model selection for dermatological applications.
Juneja et al.	2024	Suggested DERM-AI, a CNN-based model for skin disease early detection diseases.	AI-driven dermatological screening tools.
Lyakhova & Lyakhov	2024	Analyzed AI approaches for detecting and classifying skin cancer.	AI-supported cancer diagnostics.
Agarwal & Godavarthi	2023	Designed CNN-based algorithms for accurate skin disease classification.	Computer-aided dermatology diagnosis.
AlSuwaidan	2023	Applied deep learning models for dermatological disorder classification.	AI-enhanced clinical decision-making.

Rattan & Kumari	2023	Reviewed early detection methods using machine learning.	Early identification of skin diseases using AI.
Yanagisawa et al.	2023	created a segmentation model for skin disease photos using CNN.	AI-driven image segmentation in dermatology.
Ghorbani	2023	Explored AI applications in skin cancer diagnosis and prevention.	AI-powered risk assessment and treatment planning.
Alshawi & Musawi	2023	Implemented a CNN-based ensemble model for improved classification accuracy.	AI-assisted clinical skin disease classification.
Winkler et al.	2023	Assessed dermatologist-AI collaboration, improving diagnostic performance.	AI-human collaboration in dermatology.
Liopyris et al.	2022	Analyzed AI integration in dermatology, identifying challenges and benefits.	AI adoption in clinical dermatology.
Ba et al.	2022	Demonstrated how CNNs enhance dermatologists' accuracy in cutaneous tumor diagnosis.	AI-assisted tumor identification.
Rasheed et al.	2022	created a Deep neural network hybrid to classify eczema.	AI-based eczema detection and treatment.
Khan et al.	2021	Deep learning was used to multiclass skin lesions classification.	AI-supported lesion diagnosis.
Mahmood et al.	2021	Reviewed AI's role in dermatology, evaluating AI performance in clinical settings.	AI-driven dermatological research and applications.

Haggenmüller et al.	2021	Compared CNN models and dermatologists' accuracy in skin cancer diagnosis.	AI vs. human dermatologist performance analysis.
Pangti et al.	2021	created a mobile machine learning application for common skin conditions diagnosis.	Smartphone-based dermatology applications.
Salian et al.	2020	Applied models for deep learning to classify skin lesions.	AI-enhanced skin lesion classification.
Al-Masni et al.	2020	developed a hybrid CNN model for skin lesion segmentation.	Automated dermatological image analysis.
Tyagi & Mehra	2020	Optimized CNN models for dermoscopy-based disease prediction.	AI-assisted dermoscopy analysis.
Li et al.	2020	Examined deep learning methods for identifying skin conditions..	AI-driven dermatological diagnosis and research.
Wang et al.	2020	Developed a CNN-based classifier performing at par with dermatologists.	AI-powered diagnostic support for dermatologists.
Roslan et al.	2020	Evaluated CNN-based psoriasis classification models.	AI-assisted psoriasis detection.
Bae et al.	2020	Compared CNN models for beauty-related skin disease classification.	AI-based skincare and cosmetic dermatology.
Prathiba et al.	2019	suggested a deep residual network to detect melanoma.	AI-supported melanoma screening.
Reiter et al.	2019	Reviewed AI applications in skin cancer detection.	Machine learning in skin cancer diagnostics.
He et al.	2019	Developed an AI model integrating CNNs and object detection for skin disease diagnosis.	Computer-aided skin disease detection.

The reviewed studies highlight significant advancements in AI-driven dermatological diagnosis and classification, covering diverse applications such as disease detection, risk assessment, and clinical decision support. Most research focuses on enhancing the precision and efficacy of AI-based models; writers such as Wang et al. (2024) and Marri et al. (2024) have shown how well CNNs and deep learning work to diagnose complicated skin conditions. Early detection and real-time decision-making are made possible by these models, which are especially useful in mobile apps and AI-assisted dermatology.

AI-driven segmentation and classification techniques, as discussed by Yanagisawa et al. (2023) and Ba et al. (2022), are essential to medical image analysis, improving clinical workflows by providing automated, high-precision results. Meanwhile, studies by Rasheed et al. (2022) and Alshawi & Musawi (2023) focus on hybrid and methods for ensemble learning to improve classification accuracy in dermatological conditions such as eczema and skin cancer.

Another key trend is the integration of AI with clinical practice, as explored by Winkler et al. (2023) and Liopyris et al. (2022), which emphasizes AI-human collaboration in dermatological diagnosis. Additionally, research on AI-powered decision support systems, like those by Rattan & Kumari (2023), contributes to improving diagnostic reliability and reducing human error.

Beyond classification, AI is also transforming personalized skincare and cosmetic dermatology, with studies like Bae et al. (2020) investigating CNN-based models for beauty-related skin assessments. As AI continues to evolve, future research will likely focus on enhancing AI interpretability, integrating transformer-based models, and optimizing Hyperparameter to improve dermatological diagnosis, making AI an indispensable tool in modern healthcare.

7. CONCLUSION

The study emphasizes the important developments in artificial intelligence (AI) and deep learning, particularly with regard to dermatological diagnoses and Convolutional Neural Networks (CNNs). AI-powered models have outperformed conventional diagnostic techniques in the identification and classification of skin diseases. Methods like transfer learning, ensemble learning, and hybrid AI approaches have further enhanced classification precision and efficiency. Additionally, AI's incorporation into mobile apps and healthcare procedures has increased accessibility to automated skin disease diagnosis.

Notwithstanding these developments, problems including dataset biases, problems with generalization, and moral dilemmas pertaining to data privacy and AI transparency still exist. For broader implementation in actual medical settings, it will be essential to address these constraints through increased dataset variety, explainable AI (XAI) models, and thorough clinical validation. In order to improve accuracy and make decisions in real time, future research should concentrate on improving AI-driven dermatological applications by utilizing edge computing, federated learning, and transformer-based models.

In conclusion, AI-powered dermatology is rapidly evolving, offering promising solutions for early skin disease detection, risk assessment, and personalized treatment. With continued innovation and collaboration between AI researchers and medical professionals, AI has the ability to completely transform dermatological treatment by enhancing clinical effectiveness and patient outcomes

REFERENCES

[1] Agarwal, A., & Orlow, S. J. (2023). Skin in the game: an analysis of venture capital investment in dermatology from 2002 to 2021. The Journal of investigative dermatology, 143(4), 533-537.

[2] Mah, P. M. (2022). Analysis of artificial intelligence and natural language processing significance as expert systems support for e-health using pre-train deep learning models. Acadlore Transactions on AI and Machine Learning, 1(2), 68-80.

[3] Janiesch, C., Zschech, P., & Heinrich, K. (2021). Machine learning and deep learning. Electronic markets, 31(3), 685-695.

[4] Berry, E. G., Bezecny, J., Acton, M., Sulmonetti, T. P., Anderson, D. M., Beckham, H. W., ... & Leachman, S. A. (2022). Slip versus Slop: A head-to-head comparison of UV-protective clothing to sunscreen. Cancers, 14(3), 542.

[5] Liu, L., Mou, L., Zhu, X. X., & Mandal, M. (2020). Automatic skin lesion classification based on mid-level feature learning. Computerized Medical Imaging and Graphics, 84, 101765.

[6] Mahbod, A., Schaefer, G., Wang, C., Dorffner, G., Ecker, R., & Ellinger, I. (2020). Transfer learning using a multi-scale and multi-network ensemble for skin lesion classification. Computer methods and programs in biomedicine, 193, 105475.

[7] Karunanayake, R. K., Dananjaya, W. M., Peiris, M. Y., Gunatileka, B. R. I. S., Lokuliyana, S., & Kuruppu, A. (2020, November). CURETO: skin diseases detection using image processing and CNN. In 2020 14th

international conference on Innovations in Information Technology (IIT) (pp. 1-6). IEEE.

[8] Wu, Z. H. E., Zhao, S., Peng, Y., He, X., Zhao, X., Huang, K., ... & Li, Y. (2019). Studies on different CNN algorithms for face skin disease classification based on clinical images. IEEE Access, 7, 66505-66511.

[9] Ye, S., & Chen, M. (2023). The emerging role of artificial intelligence in diagnosis and clinical analysis of dermatology. Dermatologica Sinica, 41(3), 145-152.

[10] Huang, K., Jiang, Z., Li, Y., Wu, Z., Wu, X., Zhu, W., ... & Zhao, S. (2021). The classification of six common skin diseases based on Xiangya-Derm: development of a Chinese database for artificial intelligence. Journal of Medical Internet Research, 23(9), e26025.

[11] Altimimi, A. S. Z., & Abdulkader, H. (2023, October). CNN-Based Model for Skin Diseases Classification. In International Conference on IoT and Health (pp. 28-38). Cham: Springer Nature Switzerland.

[12] Zhang, J., Zhong, F., He, K., Ji, M., Li, S., & Li, C. (2023). Recent advancements and perspectives in the diagnosis of skin diseases using machine learning and deep learning: A review. Diagnostics, 13(23), 3506.

[13] Nancy, V. A. O., Prabhavathy, P., & Arya, M. S. (2024). Role of artificial intelligence and deep learning in skin disease prediction: a systematic review and meta-analysis. Annals of Data Science, 11(6), 2109-2139.

[14] Olayah, F., Senan, E. M., Ahmed, I. A., & Awaji, B. (2023). AI techniques of dermoscopy image analysis for the early detection of skin lesions based on combined CNN features. Diagnostics, 13(7), 1314.

[15] Wang, W., Chen, X., Xu, L., Huang, K., Zhao, S., & Wang, Y. (2024). Artificial Intelligence–Aided Diagnosis System for the Detection and Classification of Private-Part Skin Diseases: Decision Analytical Modeling Study. Journal of Medical Internet Research, 26, e52914.

[16] Marri, S. S., Albadri, W., Hyder, M. S., Janagond, A. B., & Inamadar, A. C. (2024). Efficacy of an artificial intelligence App (Aysa) in dermatological diagnosis: cross-sectional analysis. JMIR dermatology, 7(1), e48811.

[17] Aboulmira, A., Hrimech, H., & Lachgar, M. (2024). Skin Diseases Classification with Machine Learning and Deep Learning Techniques: A Systematic Review. International Journal of Advanced Computer Science & Applications, 15(10).

[18] Juneja, S., Tiwari, P., Devi, R., & Atwal, S. (2024, May). DERM-AI: A Convolutional Neural Network Based Approach For Skin Disease Detection. In 2024 International Conference on Intelligent Systems for Cybersecurity (ISCS) (pp. 1-7). IEEE.

[19] Lyakhova, U. A., & Lyakhov, P. A. (2024). Systematic review of approaches to detection and classification of skin cancer using artificial intelligence: Development and prospects. Computers in Biology and Medicine, 178, 108742.

[20] Agarwal, R., & Godavarthi, D. (2023). Skin disease classification using CNN algorithms. EAI Endorsed Transactions on Pervasive Health and Technology, 9(1).

[21] AlSuwaidan, L. (2023). Deep learning based classification of dermatological disorders. Biomedical Engineering and Computational Biology, 14, 11795972221138470.

[22] Rattan, P., & Kumari, A. Systematic review: An early detection of skin disease using machine learning. Data-Centric AI Solutions and Emerging Technologies in the Healthcare Ecosystem, 241-262.

[23] Yanagisawa, Y., Shido, K., Kojima, K., & Yamasaki, K. (2023). Convolutional neural network-based skin image segmentation model to improve classification of skin diseases in conventional and non-standardized picture images. Journal of dermatological science, 109(1), 30-36.

[24] Ghorbani, A. (2023). Artificial intelligence in skin cancer: a literature review from diagnosis to prevention and beyond. International Journal of Bioinformatics and Intelligent Computing, 2(2), 231-244.

[25] Alshawi, S. A., & Musawi, G. F. K. A. (2023). Skin cancer image detection and classification by cnn based ensemble learning. International Journal of Advanced Computer Science and Applications, 14(5).

[26] Winkler, J. K., Blum, A., Kommoss, K., Enk, A., Toberer, F., Rosenberger, A., & Haenssle, H. A. (2023). Assessment of diagnostic performance of dermatologists cooperating with a convolutional neural network in a prospective clinical study: human with machine. JAMA dermatology, 159(6), 621-627.

[27] Liopyris, K., Gregoriou, S., Dias, J., & Stratigos, A. J. (2022). Artificial intelligence in dermatology: challenges and perspectives. Dermatology and Therapy, 12(12), 2637-2651.

[28] Ba, W., Wu, H., Chen, W. W., Wang, S. H., Zhang, Z. Y., Wei, X. J., ... & Li, C. X. (2022). Convolutional neural network assistance significantly improves dermatologists' diagnosis of cutaneous tumours using clinical images. European Journal of Cancer, 169, 156-165.

[29] Rasheed, A., Umar, A. I., Shirazi, S. H., Khan, Z., Nawaz, S., & Shahzad, M. (2022). Automatic eczema

classification in clinical images based on hybrid deep neural network. Computers in Biology and Medicine, 147, 105807.

[30] Khan, M. A., Sharif, M., Akram, T., Damaševičius, R., & Maskeliūnas, R. (2021). Skin lesion segmentation and multiclass classification using deep learning features and improved moth flame optimization. Diagnostics, 11(5), 811.

[31] Mahmood, F., Bendayan, S., Ghazawi, F. M., & Litvinov, I. V. (2021). the emerging role of artificial intelligence in dermatology. Frontiers in Medicine, 8, 751649.

[32] Haggenmüller, S., Maron, R. C., Hekler, A., Utikal, J. S., Barata, C., Barnhill, R. L., ... & Brinker, T. J. (2021). Skin cancer classification via convolutional neural networks: systematic review of studies involving human experts. European Journal of Cancer, 156, 202-216.

[33] Pangti, R., Mathur, J., Chouhan, V., Kumar, S., Rajput, L., Shah, S., ... & Gupta, S. (2021). A machine learning-based, decision support, mobile phone application for diagnosis of common dermatological diseases. Journal of the European Academy of Dermatology and Venereology, 35(2), 536-545.

[34] Salian, A. C., Vaze, S., Singh, P., Shaikh, G. N., Chapaneri, S., & Jayaswal, D. (2020, April). Skin lesion classification using deep learning architectures. In 2020 3rd International conference on communication system, computing and IT applications (CSCITA) (pp. 168-173). IEEE.

[35] Al-Masni, M. A., Kim, D. H., & Kim, T. S. (2020). Multiple skin lesions diagnostics via integrated deep convolutional networks for segmentation and classification. Computer methods and programs in biomedicine, 190, 105351.

[36] Tyagi, A., & Mehra, R. (2020). An optimized CNN based intelligent prognostics model for disease prediction and classification from Dermoscopy images. Multimedia Tools and Applications, 79(35), 26817-26835.

[37] Li, L. F., Wang, X., Hu, W. J., Xiong, N. N., Du, Y. X., & Li, B. S. (2020). Deep learning in skin disease image recognition: A review. Ieee Access, 8, 208264-208280.

[38] Wang, S. Q., Zhang, X. Y., Liu, J., Tao, C., Zhu, C. Y., Shu, C., ... & Jin, H. Z. (2020). Deep learning-based, computer-aided classifier developed with dermoscopic images shows comparable performance to 164 dermatologists in cutaneous disease diagnosis in the Chinese population. Chinese medical journal, 133(17), 2027-2036.

[39] Roslan, R. B., Razly, I. N. M., Sabri, N., & Ibrahim, Z. (2020). Evaluation of psoriasis skin disease classification using convolutional neural network. IAES International Journal of Artificial Intelligence, 9(2), 349.

[40] Bae, C. H., Cho, W. Y., Kim, H. J., & Ha, O. K. (2020). An experimental comparison of CNN-based deep learning Algorithms for recognition of beauty-related skin disease. Journal of The Korea Society of Computer and Information, 25(12), 25-34.

[41] Prathiba, M., Jose, D., & Saranya, R. (2019, October). Automated melanoma recognition in dermoscopy images via very deep residual networks. In IOP Conference series: materials science and engineering (Vol. 561, No. 1, p. 012107). IOP Publishing.

[42] Reiter, O., Rotemberg, V., Kose, K., & Halpern, A. C. (2019). Artificial intelligence in skin cancer. Current Dermatology Reports, 8, 133-140.

[43] He, X., Wang, S., Shi, S., Tang, Z., Wang, Y., Zhao, Z., ... & Chu, X. (2019, December). Computer-aided clinical skin disease diagnosis using cnn and object detection models. In 2019 IEEE international conference on big data (Big Data) (pp. 4839-4844). IEEE.