Integrating Artificial Intelligence in dermatology: progress, challenges and perspectives

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ABSTRACT

Dermatology is currently seeing a substantial transformation due to the integration of Artificial Intelligence, particularly through the use of machine learning and convolutional neural networks. AI’s potential in dermatology is based on its ability to increase visual diagnosis, which is a core aspect of dermatological practice. This integration promises improvements in diagnostic precision, process efficiency, and personalized patient care.

Although there has been some progress, there are still obstacles that need to be overcome. The ethical considerations surrounding the confidentiality of medical data, and the transparency of AI algorithms, are of utmost importance. Additionally, the availability of high-quality, annotated dermatological datasets is a limiting factor, alongside with the need for substantial technical investments and training for healthcare professionals.

This article provides an extensive analysis of AI’s impact on dermatology, presenting its applications in various domains and discussing the associated challenges. By highlighting AI’s potential and addressing its challenges, the article aims to contribute to a deeper understanding of how AI can enhance dermatological practices to achieve better patient outcomes.

Keywords: artificial intelligence, AI algorithms transparency, triage, diagnostic precision, medical education, personalized patient care

INTRODUCTION

The field of dermatology is currently undergoing a remarkable change driven by the acceleration of Artificial Intelligence (AI). Dermatological practice integrated by AI represents the start of a new era as the precisions of machine learning (ML) and complexities of neural networks can redefine the limitations of the diagnosis, therapy, and patient care. Dermatology is a particularly good candidate because it is significantly reliant on visual diagnoses while also being heavily underserved, which makes it a candidate to benefit most from additional capabilities in terms of image analysis, pattern recognition, and data-based insights. The possible impact of AI in dermatology gives very real improvements in terms of diagnosis accuracy, process efficacy, and customization for patient treatments [1,2]. However, the path of including those elements is not straightforward – many difficulties and complications exist in the form of ethical problems, closed algorithms, issues with privacy rights, and the focus on the human factor in clinical treatment [3,4].
Thus, the evolution of AI in dermatology is not only a matter of technology adoption but also a new understanding of standard approaches. As articles show, AI-powered technologies have already proved their efficacy in improving and adjusting dermatology diagnosis and decision-making, applied from early melanoma identification to the differentiation of skin diseases as benign or malignant [5,6]. These trends open the reality where AI may democratize access to expert knowledge, support in bridging healthcare delivery inequalities, and boost patient outcomes through earlier and more precise diagnosis. The ethics of AI-powered judgments, because it relates to patient autonomy and the confidentiality of sensitive health records, demands significant consideration. In numerous instances, the “black box” of AI algorithms still presents a severe obstacle to the transparency and understandability associated with medical practice. Therefore, to overcome this void, it is vital to guarantee that we aim to create AI systems that are not just technologically cutting-edge but also ethically centered and possible to understand and reason about in a therapeutic context [7].

Moreover, the practical implications of integrating AI in clinical settings also involves the necessity to adjust existing infrastructures and educate healthcare professionals to successfully use AI. Thus, it is vital for dermatologists to have enough experience and supporting tools to work with AI technology. It implies understanding the capabilities, restrictions, and complexity of AI use within different clinical areas.

To provide a clearer understanding of the AI integration process in dermatology, the following flowchart illustrates the sequential steps involved, from data acquisition to continuous improvement (Fig. 1).

This article aims to analyze the complex functions and possibilities of AI in transforming dermatological practices in various important domains: triage, diagnosing diseases, monitoring disease advancement, personalizing treatment plans, and enhancing medical education. This research highlights the possibility of AI to improve and transform patient care procedures, starting from the first interaction and correct diagnosis of diseases, to personalized medicines and thorough disease management. Furthermore, we will discuss the profound impact of AI on the training environment for medical practitioners. In this perspective, our goal is to offer a comprehensive understanding of how AI contributes to dermatology in a way that combines different elements and brings about new ideas.

**CURRENT PROGRESS AND APPLICATIONS**

**AI for skin diseases triage**

The assimilation of AI into the dermatology triage procedures brings a revolution to the surveillance of patient care, case prioritization, and efficiency in healthcare systems. AI triage systems are designed to evaluate the urgency of dermatological diseases, quickly directing the patients to the proper level of care and assisting in the effective work management of healthcare staff.

In this context, Majidian et al. (2022) conducted a study to analyze the usage of AI in telemedicine. This research mainly focused on testing the effectiveness of the AI software for the purpose of ranking and diagnosing skin lesions as opposed to the gold standard assessment performed by board-certified dermatologists [8]. In this regard, the study used a state-of-the-art AI algorithm, TriageNet, to analyze clinical pictures of non-biopsied skin lesions. The results from the algorithm diagnosis were then compared to the results obtained from biopsy reports and three board-certified dermatologists with 18 years average clinical experience. Based on the investigation of 100 photos, the results showed a very high agreement between the diagnostic accuracy of the AI system and the dermatologists, especially for the top three differential diagnoses made by AI (basal cell carcinoma, squamous cell carcinoma and melanoma). The AI software precisely diagnosed 63% of the cases, which were almost similar to the dermatologists’ 64.3% accuracy rate, without a statistically significant difference between the two groups.

Moving on, Das et al. (2023) proposed a novel approach in the detection of nevi using various complex neural networks for the processing of images from the skin [9]. Their research explored the capabilities of the Nested Hierarchical Transformer model (NesT), besides comparisons with Vision Transformer, Big Transfer ResNetV2, and Inception-v4 models with the main objective of identifying the existence of nevi on photos uploaded to an online teledermatology platform. This AI-powered technology had the role to function in a way that is aimed at acting as a triage tool for the identification of photos with detected nevi, to prioritize dermatological appointments. The system was tested on over 26,000 clinical photographs, with a macro average recall of 0.955, an overall accuracy of 0.962, and a macro average precision of 0.958.

Thompson et al.’s (2021) study specifically focused on differentiating between benign and malignant skin lesions in a single-center, prospective, double-blinded observational study across 20 primary care practices, to answer how AI might improve the care of skin cancer [10]. The study sought to determine the accuracy of an AI-driven clinical triage algorithm in the diagnosis of skin lesions as either benign or malignant and, secondly, determine the quality of photos obtained from primary care using standardized dermatological equipment. The AI algorithm could correctly identify 242 skin lesions with a sensi-
tivity of 97.26% and a specificity of 97.92%. These results have demonstrated the high accuracy of the program in making judgments on the management of a lesion, especially when excluding uncertain lesions. Additionally, when this was compared to the histological diagnoses of 123 lesions, the AI had a sensitivity of 100%, while its specificity was 72.22%.

**AI for skin diseases diagnosis and disease severity assessment**

Use of AI in dermatology entirely revolutionized the approach to identify difficult skin conditions. The research conducted with the application of deep neural networks and convolutional neural networks (CNNs) revealed that AI not only can match but may also surpass the diagnostic abilities of experienced dermatologists. Importantly, it should be understood that the purpose of the newly introduced technology is not limited to detecting diseases but can be extended to the precise evaluation of chronic diseases’ severity.

The initial advances in the use of AI in dermatology focused on classifying skin lesions into two categories of interest: benign and malignant lesions using clinical or dermoscopic images [5,6,11]. Subsequently, studies have progressed towards a multi-class approach, presenting models that can classify conditions into various malignant and non-malignant categories, based on dermoscopic images, such as actinic keratoses, seborrheic keratoses, dermatofibroma, vascular lesions, solar lentigo, basal cell carcinoma, squamous cell carcinoma, melanoma [12,13].

In addition, a number of recent studies have analyzed the effectiveness of deep learning algorithms in identifying skin lesions and have compared their findings to those of dermatologists (Table 1). In this regard, Haenssle et al. analyzed a CNN approved for the European market (MoleAnalyzer Pro, FotoFinder Systems, Bad Birnbach, Germany) which demonstrated a sensitivity of 95.0% and a specificity of 76.7%, comparable to dermatologists’ performance [14]. Brinker et al. discovered that the CNN, which was trained using publicly available dermoscopic pictures, performed better than 136 out of 157 dermatologists and achieved an average specificity of 86.5% and sensitivity of 87.5% [15]. Maron et al. expanded the binary melanoma classification to a multiclass approach, demonstrating that the CNN achieved a specificity of 91.3% for primary classification (into benign vs malignant lesions) and 98.8% for secondary classification (into 5 different categories: actinic keratosis, intraepithelial carcinoma, benign keratosis, nevi, melanoma), outperforming the performance of 112 dermatologists [16]. Tschandl et al. conducted a study to assess the precision of a combined CNN in identifying nonpigmented skin malignancies (using dermoscopic and close-up images) which results showed a sensitivity of 80.5%, superior to human raters (divided in 3 groups: beginners, intermediate and experts) but not when compared to experts [17]. Esteva et al. showed that a CNN trained with 129,450 clinical photos had comparable performance to dermatologists in distinguishing skin diseases divided in 2 binary classifications: keratinocyte carcinomas vs benign seborrheic keratoses, and melanomas vs benign nevi [18].

**TABLE 1. Comparative analysis of AI and dermatologist performance in skin lesion classification**

<table>
<thead>
<tr>
<th>Study</th>
<th>Images datasets</th>
<th>AI performance</th>
<th>Dermatologist performance</th>
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<tr>
<td>Haenssle et al. [9]</td>
<td>Benign and malignant lesions (dermoscopic and close-up images, textual information)</td>
<td>Sensitivity 95%; Specificity 80.4%</td>
<td>Sensitivity 94.1%; Specificity 80.4%</td>
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<td>Brinker et al. [10]</td>
<td>12,378 open-source dermoscopic images for training; 100 images for the comparison of AI’s vs 12 dermatologists’ performance</td>
<td>Sensitivity 74.1%; Specificity 86.5%</td>
<td>Sensitivity 74.1%; Specificity 60%</td>
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<td>Maron et al. [11]</td>
<td>11,444 dermoscopic images of pigmented skin lesions for training; 300 biopsy verified images for the comparison of AI’s vs 112 dermatologists’ performance</td>
<td><strong>Primary classification</strong> (benign vs malignant) - Sensitivity 74.4%, Specificity 91.3%; <strong>Secondary classification</strong> (5 different categories: actinic keratosis, intraepithelial carcinoma, benign keratosis, nevi, melanoma) - Sensitivity 56.5%, Specificity 98.8%</td>
<td><strong>Primary classification</strong> - Sensitivity 74.4%, Specificity 59.8%; <strong>Secondary classification</strong> - Sensitivity 56.5%, Specificity 89.2%</td>
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<tr>
<td>Tschandl et al. [12]</td>
<td>7895 dermoscopic and 5829 close-up images of excised lesions for training; 2072 unknown cases for the comparison of AI’s vs 95 human raters’ (medical personnel, including 62 board-certified dermatologists) performance</td>
<td>Sensitivity 80.5%; Specificity 51.3%</td>
<td>Sensitivity 77.6%; Specificity 51.3%</td>
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<tr>
<td>Esteva et al. [13]</td>
<td>127,463 clinical images for training; 1942 biopsy labelled images for the comparison of AI’s vs 21 dermatologists’ performance</td>
<td>AUC= 0.96 for clinical images on the larger dataset; AUC= 0.94 for dermoscopic images on the larger dataset</td>
<td>Sensitivity and specificity comparable with AI model (values not available)</td>
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Another area of dermatological diagnosis that has significantly benefited from AI is described in Han et al. (2018) study. In this work, the authors demonstrated that deep neural networks, particularly the ensemble model that combined ResNet-152 and VGG-19 architectures, can diagnose onychomycosis no less effectively than experienced human dermatologists, and, in fact, in several performance metrics, the AI model was substantially more successful [19]. The authors trained deep learning models on 49,567 images and successfully fine-tuned them to recognize onychomycosis from typical images of nails. The datasets from multiple institutions used for validation showed that the AI models had a sensitivity and specificity range of 82.7–96.0% and 69.3–94.7%, respectively, and its Area Under the Receiver Operating Characteristic Curve (AUROC) was 0.82–0.98, superior to that of most of the dermatologists involved in the study.

Furthermore, Han et al. (2020) have reported the significant diagnostic capabilities of a particular CNN, which was trained on a dataset of 220,680 pictures representing 174 different skin diseases [20]. As a result of the model training, the CNN was able to accurately make binary diagnoses, distinguishing between malignant and benign lesions using the SNU and Edinburgh datasets, with AUCs of 0.937 and 0.928, respectively. Additionally, the CNN was able to suggest one of the four primary treatment plans (steroids, antibiotics, antivirals, and antifungals) with a reasonable level of accuracy. Moreover, the model has demonstrated exceptional capabilities in classifying many classes and was able to distinguish between 134 different skin conditions. This significantly enhanced the accuracy of malignancy predictions and treatment decisions made by dermatologists and dermatology residents, serving as an extra tool to aid their practice. The study has demonstrated also the important advancements in diagnosis accuracy facilitated by AI, which have the potential to progress into predictive treatment planning, announcing a new era of augmented intelligence in dermatology.

Apart from the skin tumor classification, Shen et al. (2018) developed a first-of-its-kind automatic diagnosis method based on CNNs that can classify different types of acne vulgaris with high accuracy [21]. Its key feature was the utilization of CNNs to carry out feature extraction from facial images, subsequently dividing the images into seven categories, one of which is healthy skin, and the rest are six types of acne vulgaris lesions, including papules, open and closed comedones, pustules, cysts, and nodules. This model resolved previous limitations in terms of narrowing down the diversity of acne types and provided a thorough and detailed perspective on acne vulgaris. Through comparing the VGG16 network to custom CNN models, the study showcased the superiority of feature extraction, indicating the significance of deep learning for effective diagnosis.

Zhao et al. (2019) used an even more innovative solution to the relevant problem of diagnosing psoriasis and specially intended for the regions of severe shortage of dermatological expertise. As the performed study disclosed, the AI-based system integrating CNNs turned particularly suitable for detecting psoriasis using clinical images [22]. The two-stage deep learning model was trained on a dataset incorporating 8021 images of 9 common skin disorders. Initially, a multi-label classifier was trained to recognize the particular visual patterns presented in the cases of different skin diseases. Then, a second stage was implemented focusing on considering the cases of psoriasis, distinguishing it from the remainder of other diseases. The achievement of the two-stage classifier presented an AUROC of 0.981 which outperformed the results of 25 experienced Chinese dermatologists on 100 clinical images.

It is also important to note that significant progress has been achieved with the application of AI in various other dermatological areas, including diabetic ulcers [23,24], sexually transmitted infections [25,26], dermatopathology [27] or cosmetic dermatology [28] (Table 2).

In terms of disease severity assessment, an AI algorithm was developed by Seité et al. (2019) for smartphones, to test its accuracy in grading facial acne severity using the Global Acne Severity scale [29]. The research included analysis of 5,972 images from 1,072 acne patients featuring a variety of acne severity levels. The algorithm was developed on two platforms, the iOS, and Android, to ensure applicability. The ability to grade acne severity and even identify the type of lesion (comedonal, inflammatory, post-inflammatory hyperpigmentation) was demonstrated after extensive training, based on the acne severity grading performed by three dermatologists and the learning sample that was subsequently obtained to adjust the algorithm. Ultimately, the algorithm achieved a final Global Acne Severity grading accuracy of 68%, the same as dermatologists, but showed a high precision and recall in lesion identification; its score reached 84% for inflammatory lesions, 61% for non-inflammatory, and 72% for post-inflammatory hyperpigmentation.

Considering the problem of subjectivity and variability of Psoriasis Area and Severity Index (PASI) scoring system, Fink et al. (2019) conducted a comparative observational study in order to assess the precision and reproducibility of Automated Computer-guided PASI Measurements (ACPM) in comparison to those made by three independent trained physicians [30]. The study, which involved 120 patients diagnosed with plaque psoriasis of various severities, has implemented Automated Total Body Imaging and...
### TABLE 2. AI performance in various dermatological applications

<table>
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<tr>
<th>Study</th>
<th>Dataset</th>
<th>Study aim</th>
<th>AI performance</th>
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<tbody>
<tr>
<td>Cassidy et al. [18]</td>
<td>203 foot photographs collected using a smartphone</td>
<td>Detection of diabetic foot ulcer</td>
<td>Sensitivity= 0.91; Specificity 0.88</td>
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<tr>
<td>Chan et al. [19]</td>
<td>547 wound images of patient with diabetic foot ulcer</td>
<td>Comparison of the intra- and inter-rater reliability of an artificial intelligence-enabled wound imaging mobile application (CARES4WOUNDS [C4W] system, Tetsuyu, Singapore) with traditional measurement performed by trained nurses</td>
<td>Inter-rater reliability for: Length - 0.825–0.934, Width - 0.825–0.930, and Area-0.872–0.932</td>
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<tr>
<td>González-Alday et al. [20]</td>
<td>261 images (42 of the herpes class, 34 of genital warts and 185 of condylomas)</td>
<td>Build an image analysis system that can aid clinical diagnosis in Sexually Transmitted Diseases (STDs)</td>
<td>Overall accuracy of 86.6% in detecting STDs (higher for condylomas, due to high number of images in this class, compared with the other 2 diseases less represented)</td>
</tr>
<tr>
<td>Latt et al. [21]</td>
<td>Self-reported demographic and sexual behavioral data and laboratory-confirmed diagnoses from 167,451 individuals</td>
<td>Risk prediction for 4 major infections—HIV, syphilis, chlamydia, and gonorrhea</td>
<td>Median risk scores and IQRs (interquartile range) for all participants: 0.32 (0.15–0.62) for the HIV data set; 0.35 (0.16–0.47) for the syphilis data set; 0.37 (0.12–0.57) for the gonorrhea data set; 0.42 (0.31–0.55) for the chlamydia data set</td>
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<tr>
<td>De Logu et al. [22]</td>
<td>Training/validation set: 1,377 patches of healthy tissue and 2,141 patches of melanoma. Test dataset: 791 patches of healthy tissue and 1,122 patches of pathological tissue</td>
<td>Development of an artificial intelligence system for recognition of cutaneous melanoma from histopathological digitalized slides</td>
<td>Accuracy= 96.5%; Sensitivity= 95.7%; Specificity= 97.7%</td>
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Computerized digital image analysis to calculate the PASI score. As a result, regarding PASI mean, it was established that ACPMs appeared to have a high degree of agreement with the raters, with an Intraclass Correlation Coefficient (ICC) of 0.86, indicating a strong correlation and minimal absolute difference in PASI points. Moreover, ACPMs demonstrated superior reproducibility, with an ICC of 0.99 for repeat measurements, outperforming the intra-rater reliability of physician scores. Also, Fink et al. have admitted that not all parts of the body were observable, and even when used, the patients were not fully able to maintain the rater position, implying that there are further grounds for technological advancement and procedural optimization [30].

### AI for skin disease treatment prediction

The use of AI in dermatology is evident not only in the improvement of disease diagnosis but also in the capability to forecast the effectiveness of treatment. A significant application is the use of ML to predict treatment outcomes for skin conditions, demonstrating the vast potential of AI and its capacity to revolutionize patient care by enhancing medicinal approaches. For instance, in their innovative attempt to surpass the current trial-and-error approaches to treating psoriasis, Emam et al. (2019) utilized ML to predict long-term responses to biological therapies among psoriasis patients [31]. As identified in their research that used techniques such as generalized linear models, support vector machines, decision trees, random forests, gradient-boosted trees, and deep learning among the 681-patient Danish registry cohort DERMBIO, several models achieved great accuracy rates in their calculations of patient demographics, disease characteristics and therapy details. The research indicated that ML was highly accurate, with outcomes ranging from 73% to 82% based on available clinical data. From all the techniques used, the generalized linear model was identified as the most effective in terms of accuracy, offering valuable insights into patient characteristics most helpful to sustained treatment without withdrawal [31].

Similarly, Cazzaniga et al. (2009) used a new approach to improve the management of vitiligo treatment. The authors investigated the efficiency of artificial neural network models for predicting the response to Excimer Laser therapy, one of the targeted phototherapy treatment options for vitiligo patients [32]. Based on the outcomes of the randomized controlled trial, data on 325 treated vitiligo patches were gathered to be analyzed regarding repigmentation results. As multiple complex determinants affected the repigmentation, such as patient age, gender, location of the lesion, and the Excimer Laser therapy regimen used, traditional statistical methods were insufficient to
make predictions due to the data's multivariate character. In this respect, the authors used neural network models that could detect complex nonlinear relationships in the data. Two networks were used, the first being the discriminant network, with 66.46% accuracy, for classifying responders vs non-responders. The second was the regression network for estimating the repigmentation time in responders, with a mean absolute error of 19.58.

**AI in dermatology medical education**

The use of AI-powered tools in dermatology education transforms the experiences, creates opportunities for personalized feedback, and optimizes administrative tasks, which makes training sessions more efficient. In particular, it is possible to speak about the important function of AI technologies, such as intelligent tutoring systems, virtual patients, or adaptive learning programs.

In this regard, intelligent tutoring systems (ITSs) should be taken into consideration as an innovative approach to dermatology education. When medical practitioners use ITSs, they receive one-on-one tutoring that is similar to the one delivered by a human instructor, but the software provides personalized instructions based on students' style of learning and performance data [33]. On one hand, they help identify the physicians' knowledge gaps; on the other hand, they adjust learning materials intelligently. Therefore, all learners can proceed with learning at their own speed and develop an understanding of all aspects of dermatological conditions and management [34].

Additionally, virtual patients (VPs) are one of the other major ideas that can impact education within dermatology. Residents may communicate with VPs and simulate clinical circumstances. Utilizing VPs as instructional tools give learners the opportunity to experience clinical settings and circumstances without the responsibility. These AI-powered learning environments enable learners to develop and practice clinical reasoning skills while keeping their decision-making skills in check [35]. VPs may present an extensive range of dermatological diseases to residents, and from that perspective alone, using VPs as a teaching tool may fundamentally transform the educational experience [36,37].

Another way of enabling personalized education is digital learning platforms for adaptive learning. These are AI-based systems, which assess the learners' knowledge and adjust the level and sequences of the learning material to respond to the individual students' performance. In such a manner, a learner is constantly challenged by the adaptive system, but the tasks are always at an appropriate level of complexity to prevent the student from becoming overwhelmed. Hence, learners are more likely to develop a stronger, more complete understanding of the basics of dermatology [38]. Moreover, AI can analyze performance data sets from different students and find patterns to which teachers can then react, customizing their learning approaches to each student.

Finally, AI extends to research support. AI-powered tools can locate literature, process it, analyze data, and help craft manuscripts and other documents. As a result, teachers’ and learners’ knowledge of recent dermatological discoveries expands and integrates ever-new scientific knowledge [39]. In this context, AI integration into dermatology medical education benefits the related programs by enhancing their quality and proficiency and allows future dermatologists to use AI in their profession, making them a new type of versatile, technology-savvy physicians.

**CHALLENGES**

Although AI's assimilation in dermatology is promising, many challenges impede its full potential. One major challenge is the ethical implications surrounding the application of AI in medical practice. Critical privacy issues such as who owns patients' health data or consent to access patients' information are in question. The performance of AI usually relies on massive personal and sensitive health data, and it is important to ensure that they adhere to the data protection regulation, such as GDPR in Europe or HIPAA in the US, to enhance patient trust and confidentiality [40]. Additionally, many AI algorithms are “black boxes”, as their decision-making roles remain relatively unknown. Sometimes, a black box AI could reduce acceptance among healthcare practitioners and impede patients from having confidence to use a system with which they are unfamiliar [41]. Another issue is the availability of high-quality annotated dermatological datasets. Datasets can vary in quality, such as image quality, lighting, or demographic distribution, which impacts the generalization and reliability of the AI system [13]. The infrastructural and logistic of integrating AI into clinical settings are another concern. Medical personnel needs to be trained, which cost resources, and investing in new facilities [42]. Lastly, a potential foe is over-reliance on AI to the point that clinical skills in dermatology are lost [6]. To tackle all the challenges raised above it is needed a multi-stakeholder approach ranging from ethicist, engineers, medical experts, or policy-making, to develop AI systems that are not only technically proficient but also ethically and user-friendly [43].

**PERSPECTIVES**

The future of AI-based tools in dermatology is very promising and seems likely to bring about a revolution in this field shortly. The development of AI systems is likely to be accompanied by increasing
transparency and interpretability of the processes, which will stimulate trust among both medical professionals and patients. Similarly, significant efforts are being made to facilitate the creation of explainable AI systems that allow clinicians to understand the rationale behind decisions [44]. The availability of large and high-quality dermatologic datasets will facilitate the development and training of AI models to ensure their reliability and accuracy across multiple populations and clinical environments [45]. AI will have the possibility to be integrated into genomic or telemedicine platforms, where it can play an essential role in the development of personalized, precision medicine [46]. Furthermore, AI used in teledermatology can improve access to dermatologic care and make it available for underserved and remote populations [47]. However, new AI technologies that are under development are not supposed to replace but to amplify human expertise. This fact implies that dermatologists will remain at the center of decision-making processes, with AI helping them to enhance treatment and diagnostic plans. Moreover, the continued cooperation between professionals and stakeholders will increase the speed of new inventions within the field and the rate of their implementation. Emerging challenges can be addressed, and with accelerated innovation and usage of current technologies, AI can transform the field of dermatology making care more efficient and accessible in the nearest future.

CONCLUSIONS

In conclusion, dermatology is at the threshold of a revolution due to the implementation of AI. The development of diagnostic and treatment algorithms, as well as proper medical education, will be considerably enhanced in the long run. Despite the challenges emerging from ethical and data safety perspectives and the considerable amount of work and effort necessary to ensure the availability of high-quality datasets, AI offers a great chance to change dermatologic practice. By encouraging cooperation, and communication between dermatologists, AI experts, and data scientists and ensuring the universality of technologies and AI with a foundation of transparent and ethical behavior, the future of dermatology is destined to be far more precise and expressive than it is today, and patients will undoubtedly benefit from it.

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