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Letter to Editor

Artificial intelligence in dermatology – Where do we stand?

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Sir,

Artificial intelligence (AI) has been around for decades. It has even been used in health-care since the early 2000s. However, today, it is making its way into our everyday lives and work environments in ways that were not possible just a few years ago.

Today, AI is redefining the way we work. AI has been used in many industries and fields, including dermatology. In recent years, there has been a growing interest in using AI for diagnosis purposes. In fact, several studies have shown that this technology can improve efficiency and accuracy when it comes to making diagnoses – and sometimes even save lives!

AI AND MACHINE LEARNING (ML) IN DERMATOLOGY

The use of AI in dermatology is an evolving area with multiple applications, including the differentiation between benign and malignant pigmented skin disorders.[1] In addition, AI may also help facilitate other tasks that can be challenging for practitioners due to their large volume as well as high variability.[2] AI can aid in assessing the clinical profile and planning treatment plan for patients with inflammatory disorders, the assessment of cutaneous ulcers, for studying the genetic sequence of diseases, among other things.[3]

For many years, ML has been used to analyze and classify data from skin lesions.[2,3] At present, trained AI is able to distinguish between benign nevus and malignant melanoma by examining the individual pixels in dermatoscopic and non-dermatoscopic images.[3-9] However, potential errors and issues with image quality and privacy remain significant barriers to the use of AI in this area. Recently, computer models such as ML and convoluted neural networks (CNNs) have demonstrated high accuracy in classifying melanoma on histopathological or clinical images.[10-12]

Researchers have trained ML models using large data sets that include more racially and ethnically diverse populations, making the technology more accessible for use in remote, as well as resource-limited health-care settings.[10] This, coupled with the monumental rise in smartphone usage of applications, aids in the assessment of the risk of cutaneous malignancies, premalignant, and benign disorders based on photographic data.[13-15]

In another study, researchers compared the accuracy of RCM and dermoscopy in diagnosing melanocytic lesions with peripheral globules. The results showed that both techniques were highly accurate – with 100% sensitivity for diagnosing melanomas and 84.21% for dysplastic nevi. The study found that dysplastic nevi and benign melanocytic lesions differed significantly on the basis of sizes and shapes of the peripheral pigmented globules.[16]

According to Gomolin *et al*.[3] and Schäfer *et al*.,[17] the use of AI in the assessment of ulcers is superior to clinical examination assessment. Another review by Du *et al*. has also stated that ML is able to precisely predict the clinical outcome and prognosis of cutaneous disorder with high index of proficiency.[18]

The use of AI in diagnostic dermatopathology has also demonstrated to improve accuracy and efficiency. In one study, deep learning algorithms were trained to recognize whole slide images (WSIs) of various skin conditions, including dermal nevi, seborrheic keratoses, and nodular basal cell carcinomas, with high accuracy.[19] Another study developed a deep learning algorithm that classified WSIs into four diagnostic categories (squamous, basaloid, melanocytic, and other) and had an overall accuracy of 78%.[20] AI has also been used to differentiate melanoma from nevi, with a convolutional neural network significantly outperforming pathologists in accurate diagnosis.[21]

In addition, AI has been utilized to predict the recurrence rate of distant metastases and evaluate the survival rate in the early stages of melanoma. A study comparing the diagnostic accuracy of AI and expert dermatopathologists found that AI had a diagnostic accuracy of 96.5%, sensitivity of 95.7%, specificity of 97%, and concordance of 96.6%.[22] These findings suggest that AI has the potential to assist in the diagnosis of various skin conditions on histopathology and

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may be particularly useful in resource-limited settings with high incidence or prevalence of skin cancers.

A recently developed ML model can predict the impact of Risankizumab withdrawal in psoriasis on patient's quality of life.[23] However, the researchers emphasized that there is still a need for multicentric prospective clinical trials to validate the usage of ML models.

Another study by Showalter *et al*.[24] found that AI is useful in determining the histological features and genetic expression of clinical improvement in inflammatory disorders like systemic sclerosis.

In view of the social distancing restrictions during COVID-19, the field of digital imaging has flourished rapidly. With the heavy reliance on teledermatology imaging for the diagnosis of cutaneous disorders, the concept of AI flourished further. AI-powered tools in teledermatology can analyze and classify medical images, such as dermatoscopic images, with high accuracy. This can assist dermatologists in making more accurate diagnoses, particularly in cases where the image quality is poor or the lesions are subtle. In addition, AI can be used to extract relevant features from medical images and generate a diagnosis or treatment recommendation based on those features. This can help to streamline the decision-making process for dermatologists and improve the overall efficiency of teledermatology consultations.

There are several CNN models under development for detecting COVID-19 specific skin diseases like pseudo-pernio in patients across all skin types to optimize contact-free healthcare.[25]

Although there are multiple applications of AI in the field of dermatology, there still exists an invisible veil of barrier between the patients and AI preventing its uptake by the masses. Carrying out a full-body examination is still not very feasible with AI, especially if the health-care consultation is being done remotely. The cost of installing teledermatology, including equipment, staff training, and technology implementation while ensuring that the encryption to protect the patients' confidential medical data is secured, can be economically straining. The heavy reliance of teledermatology and AI on clinical images is also a big drawback, since every patient does not have a high quality image camera. Gomolin *et al*. has pointed out that the technology lacks heterogenecity, generalizability, interpretability, and standardization.[3]

CONCLUSION

AI is here to stay. The future of AI and dermatology is promising. We can expect to see more applications in the coming years, and we hope this article helped you understand how AI is already being used in dermatology today.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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