

Letter to Editor

Smartphone-Assisted Artificial Intelligence in Dermatology- A Novel Approach to Help General Practitioners in Underserved Areas

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Citation: Shah S, et al. Smartphone-Assisted Artificial Intelligence in Dermatology- A Novel Approach to Help General Practitioners in Underserved Areas. J Dermatol Res. 2023;4(1):1-3.

<https://doi.org/10.46889/JDR.2023.4103>

Received Date: 11-02-2023

Accepted Date: 24-02-2023

Published Date: 04-03-2023



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Artificial intelligence is a branch of computer science that deals with the development of computer programs that aims to reproduce the human intelligence process [1]. Artificial intelligence has a crucial role to play in the field like dermatology in which visual data interpretations are required.

Recent interest in AI had been driven by an evolution in machine learning resulting in the arrival of 'deep learning.' Given sufficient dataset size and processing power, deep learning utilizes Convolutional Neural Networks (CNNs). Deep learning technique is basically the modernized extended version of classical neural networks. The current neural network that is used is more superior in terms of the classical neural network as the current deep learning neural networks had multiple layers [2]. The deep learning method tends to deal with more complex and non-linear data. The deep learning in comparison with the classical neural networks can handle the larger volume and wide complex of data. As it learns directly from the dataset without human direction, deep learning is able to account for inter-data variability as well as process unstandardized data. AI algorithms have been currently used in the diagnosis of diabetic retinopathy, congenital cataracts, melanoma, and onychomycosis [3]. Outside clinical care, AI is being employed to support and potentially replace the roles of healthcare managers in resource, staffing, and financial management.

The mobile phone application in dermatology has been used in diagnosing common skin conditions to provide an effective dermatological cure. In a study done in 2013, around 229 dermatology related applications were analyzed and the app identified in the various categories such as general dermatology reference, self-diagnosis, tele dermatology consultation, Sunscreen

UV calculation. The results showed that mobile phone applications used as general dermatology references were the highest followed by self-diagnosis of the disease as the second [4]. The AI-driven mobile phone applications can lead to a more accurate diagnosis of the disease where a trained dermatologist is lacking. The general practitioners, especially in rural areas tend to have less knowledge. A study done by federman, et al., showed that the accuracy of non-dermatologists was only 52% against 93% of dermatologists in diagnosing common skin diseases [5]. On the common dermatological problems encountered on a daily basis.

The level of agreement between PCPs and dermatologists was around 56% and 65.52% in diagnosis of common skin diseases in other studies [6]. In another study done by Liu, et al., a deep learning system was developed to diagnose twenty-six common skin conditions based on both the clinical images and associated medical histories. The performance of the PCP and nurse practitioners was less than the deep learning for both the top 1 and top 3 accuracies. Similarly, the top 1 accuracy of deep learning versus dermatologist was slightly higher but the top 3 accuracy was the highest [7]. The performance of PCP and dermatologists has been studied in various settings and in another study done to assess the diagnostic accuracy between the non-dermatologists

and dermatologists [8]. An accuracy of around 45% was found out. The primary care physicians diagnosed the common skin conditions more effectively such as acne, wart, tinea, eczema rather than the uncommon skin lesions. In another study done by Esteva, et al., CNN was trained with 129,450 clinical images consisting of 2,032 different diseases 3,374 dermoscopic images. Initially, the three-level taxonomy was used and to further validate the CNN, the images that were biopsy-proven were used and it was compared with 21 dermatologists and for the result showed that CNN was able to classify the skin cancer as effectively as dermatologists [9].

In another study, a mobile application (app) was used, which was developed on a convolutional neural network (CNN)-based algorithm trained with clinical images of 40 different skin conditions as well as with normal skin (as reported elsewhere). A total of 1004 patients (675 males and 329 females) were included in the study. The age of the patients ranged from 18-74 years. Eight dermatologists and 13 non-dermatologist physicians participated in the study. Out of 1004 patients whose images were evaluated by two non-dermatologists, 670 belonged to the 40-diseases group of the app, and 334 belonged to 41 different diseases outside of the 40-diseases group. The overall top-1 accuracy of the app at 72.04% was significantly higher than the top-1 accuracy of two non-dermatologists at 45% and 34.85%, respectively [10]. The use of neural network in the diagnosis of common skin cancer like squamous cell carcinoma, basal cell carcinoma, actinic keratosis, and melanoma showed that the neural network effectively can diagnose skin neoplasms [11]. Prompt referral can be made to the tertiary care centre and necessary interventions can be made. Diagnosing cutaneous neoplasm is a major hurdle and AI can help the general practitioners in broader way leading to more effective patient care.

For the diagnosis of melanoma using the deep learning neural network that was compared with the 58 dermatologists. The melanoma images that were used were dermoscopic images. The results showed that the CNN ROC had higher specificity of 82.5% compared to the level 1 dermatologists and level 2 dermatologists (71.3% and 75.7%) [12]. CNN basically performed much better than some of the dermatologists.

Keywords: Artificial Intelligence; Dermatologists; Convolutional Neural Networks; Clinical Care

Conflict of Interest

The authors have no conflict of interest to declare.

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