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Deep learning surpasses dermatologists

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Summary

Skin cancer is increasing worldwide. However, it is not always practical to send all patients with skin symptoms to dermatology clinics. Artificial intelligence holds great promise in helping the screening for and diagnosis of skin cancer. Although several computer-aided classification systems have been introduced that achieve high sensitivity of melanoma detection, low specificity was a trade-off for high sensitivity. Sensitivity measures the proportion of 'actual positives' that are correctly identified (e.g. the percentage of sick people who are correctly identified as having the condition). Specificity measures the proportion of 'actual negatives' that are correctly identified as such (e.g. the percentage of healthy people who are correctly identified as not having the condition). The application of a new machine learning method, called deep convolutional neural network (DCNN), to a skin cancer classifier can potentially improve skin cancer screening sensitivity and specificity. However, the number of training images required for such a system is thought to be extremely large and compiling a large data set for rare skin conditions is difficult. In this study, we trained DCNN using fewer than 5000 images, and developed a DCNN classifier that can classify 14 different skin tumors and related conditions. Its performance was tested against 13 board-certified dermatologists. As a result, our system requires only a single image and comes with 96.3% sensitivity and 89.5% specificity in the detection of skin cancer. The accuracy of malignant or benign classification by the DCNN achieved statistically greater accuracy compared with board-certified dermatologists, 85.3% and 92.4%, respectively. In conclusion, we used DCNN trained with a relatively small number of images to develop an efficient skin tumor classifier. The current system could be used in screening purposes in general medical practice but it needs to be thoroughly tested in clinical trials first.