

AI, are dermatologists' days numbered?

SYNOPSIS

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INTRODUCTION

Artificial Intelligence (AI) has been defined as a 'system's ability to interpret and learn from data, and to use this to achieve specific goals through adaptation'¹.

Although AI in healthcare is in early stages of development, their potential is far reaching, particularly in dermatology where visual recognition predominates diagnoses. AI could result in greater diagnostic capability and optimised patient care. However, difficulty training AI, ethico-legal concerns, and patient distrust casts doubt on the replacement of dermatologists by AI.

SUCSESSES AND OPPORTUNITIES

NEURAL NETWORKS AND PATTERN RECOGNITION

Machine learning considers inputs and outputs to 'train' programmes, which can then take new inputs and infer outputs, becoming autonomous. Neural networks go further, processing data sequentially through layers creating robust predictive systems² [figure 1]. Esteva et al.³ used a dataset of 125,450 images to train a convolutional neural network (CNN) to discriminate between benign lesions and melanoma. When tested this network performed on par with 21 qualified

dermatologists. Another study⁴ compared a CNN's diagnosis of melanoma against 58 dermatologists and found that the majority were outperformed. Their recommendation was that irrespective of experience, physicians could benefit from CNN.

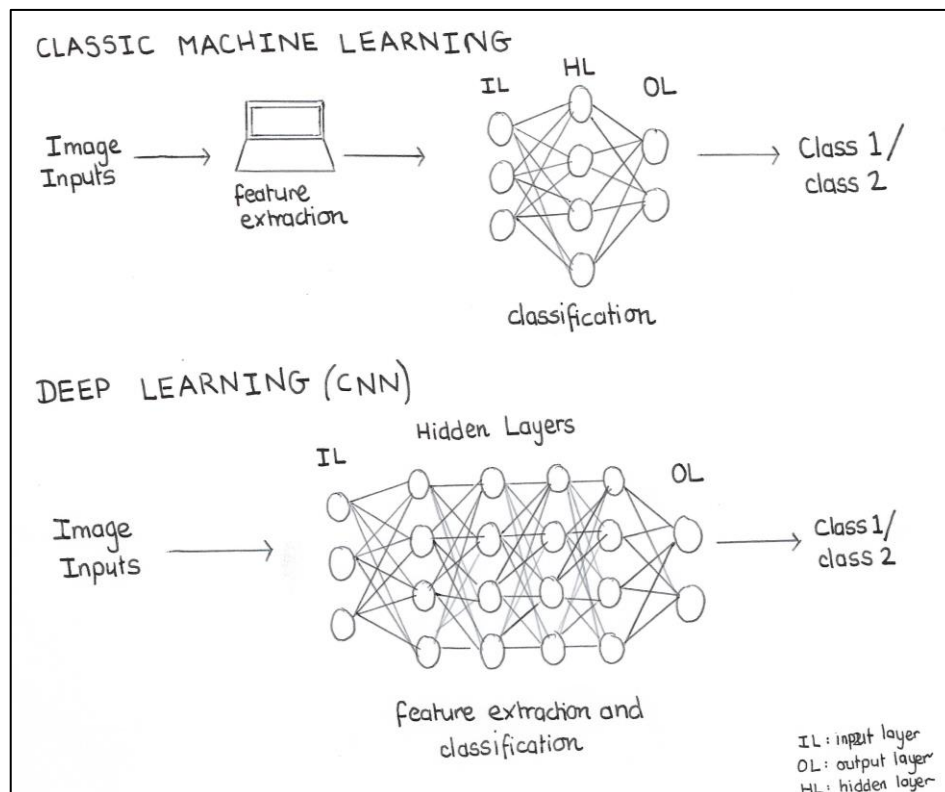


Figure 1

The success of AI in diagnostic dermatology isn't limited to melanoma. CNN have been shown to identify seborrhoeic keratosis, basal cell carcinoma⁵, rashes and nail disorders^{6,7}.

INTEGRATION OF DATA AND INCREASING ACCESS

A great prospect for AI is surveillance. AI can accurately document disease progression. AI evaluated 479 patients with acne achieving the correct grading with an accuracy of 0.85⁸. Software like this could be used to interpret acne progression and treatment response. Another opportunity is the ability of AI to access EMRs

easily⁹, cross referencing other medical conditions. A system like this could save time trawling through notes.

AI offers the promise of a standardised level of care, regardless of location or doctor.

LIMITATIONS

PROBLEMS WITH CNN

Despite optimistic results, AI has not yet integrated into mainstream dermatology.

Currently massive data sets are required for training. Most CNNs are fed by histopathologically diagnosed lesions¹⁰. Elmore et al. reported a 75% disagreement between histopathologists diagnosing early melanoma¹¹. Clinicians are able to account for this limitation in decision making, AI cannot.

There are also ethico-legal implications for AI. Currently we cannot understand the complex methods used to generate predictions. This hinders acceptance. Once AI systems begin making autonomous decisions when something goes wrong, who is at fault⁹ and how does one identify why the mistake has occurred if we don't know the process behind it?

IMPORTANCE OF HUMAN INTERACTION

AI algorithms only take into account the appearance of a lesion without the clinical history and physical examination. While dermatology is primarily a visual speciality it is also a tactile one. Subtle melanomas may become more apparent with touch or stretch, and here AI cannot compete¹².

Ill patients want their physicians communicate clearly and be compassionate and empathetic¹³. AI cannot engage in this way. A study into 'Algorithm aversion' found that humans were less tolerant of machines making mistakes¹⁴. Human's ultimately prefer and trust another human more than AI.

CONCLUSION

The potential for AI in dermatology is immense in prevention, diagnosis and treatment. However, dermatologists' days are not numbered. AI can aid dermatologists. Humans and AI working together achieve a higher level of accuracy in diagnosis and prognosis¹⁵. The future seems to hold more promise for integrative decision support systems rather than fully automated systems (figure 2). AI will be able to clear the way for value added tasks such as increased relationship building and treatment plans to match patient goals¹⁶. AI will inevitably reshape the role of dermatologists, but dermatology as a speciality will continue to thrive, aided by AI.

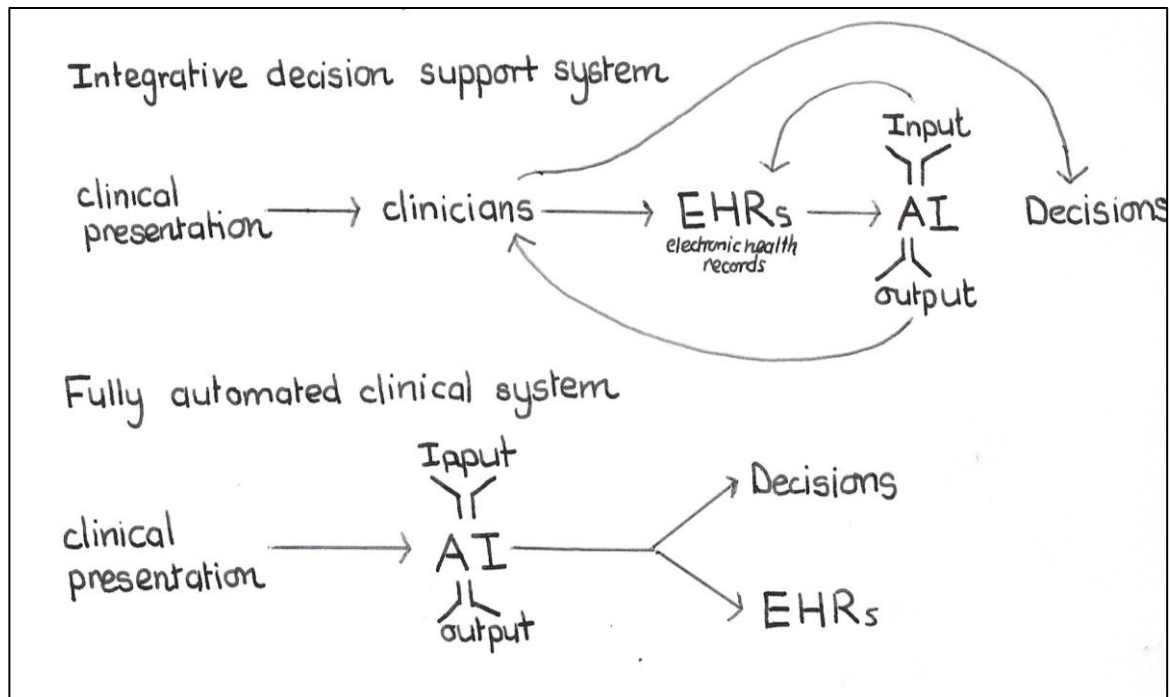


Figure 2

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