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Unintentional consequences of artificial intelligence (AI) in dermatology for patients with skin of colour

Dear Editor,

Recently, there have been concerns that dermatology resources and education lack sufficient material regarding patients with skin of colour(SOC) in the Western world.[1] In the UK, we have an increasingly diverse population, of which 14% have non-Caucasian skin types, necessitating a shift in our educational focus to reflect our changing environment in order for dermatologists to feel comfortable managing conditions in SOC.[2] These population groups may be disadvantaged and feel disenfranchised if we are unable to recognise and understand conditions pertinent to their ethnicity and skin type. Positive steps are being made, with additional educational resources produced and the formation of collaborative projects and committees to increase inclusivity.

Development of dermatologic AI systems are already underway to provide machine-led diagnosis alongside dermatologists to detect skin cancers. Harnessing this technology, in the form of smartphone applications, may potentially lead to low-cost and easily accessible use of AI by the general public. However, this relies on adequate image capture and reliable interpretation of these images via the AI algorithm.

Sadly, our history with image capture has been fraught with racial bias. Early development of coloured photographs involved the use of 'Shirley cards', an image of a Caucasian lady used as a standard to calibrate colours against. This led to improper capture of darker skin tones, with some individuals being nearly invisible. It was only in the 1990s that multiracial variants of this

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card were created by Kodak. Sadly, the impetuses for this change were complaints from chocolate companies regarding inaccurate capture of brown tones in their chocolate as opposed to inadequate photography of people with SOC. Digital photography has brought forward advancements such as image stabilisation and more inclusive colour-correction tools. Additional lighting from flash photography can provide further image clarity by delineating details on darker skin types. However, it may also result in light artefact or over exposure thus affecting colour saturation.[3]

One may assume that an AI algorithm is free of bias due to its scientific basis. However, the method of deep learning, the way by which algorithms learn, based on artificial neural networks, is based on pattern recognition built from existing banks of data. How this data is collected, and organised is important, as existing bias can be introduced to the algorithm unintentionally as a consequence of the way the algorithm weighs certain variables. Lack of diversity and small data sets are a few examples of how bias can be unintentionally introduced.[4] Existing projects, e.g. the International Skin Imaging Collaboration Melanoma Project, are of predominantly light-skin participants, likely reflective of local populations of collaborating nations and the reduced incidence of melanoma in darker skin types.[5] Resultantly, this may introduce a risk of reduced sensitivity in diagnosis and poorer outcomes with AI in patients with SOC. First Derm, a private company that developed the Skin Image Search app, noted only 5-10% of their database included darker skinned images.[6]. A study using their app showed a reduced diagnostic accuracy of 17% after reviewing 123 images of skin type 6.

Examples of racial bias in image-based algorithms have already become apparent, highlighting the limitations of AI. In 2015, a Google photo-categorisation service mis-categorised black individuals as gorillas.[6] Albeit an unintentional occurrence, this example demonstrates the complex neural networks required to correctly categorise objects. In an ideal world, these instances of racial insensitivity would likely have never intentionally occurred with human led systems. A naïve lack of foresight meant these biases were not considered or tested for.

In 2016, the UK government launched an electronic face-detection system employed to detect suitable photographs for passport applications. Prior to its release, it was noted the system was unable to detect acceptable photographs for users with very light or very dark skin. Despite this, the system was launched. SOC users soon reported inaccuracies as the photo-checker

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misidentified their closed lips as an open mouth. Perhaps this error was not addressed as it was thought to only affect a minority of individuals, yet this conclusion is unacceptable as there should be no room for racial disparity,.[7]

Racial bias, intentional or not, is very real risk of AI diagnostics and its significance and steps to avoid it must be considered from the outset. International collaboration of diversified image banks used in AI systems may help reduce this bias. It is imperative work is done to adequately represent SOC in all AI systems in order to harness their full potential, or we cannot truly claim we champion the rights of our patients and provide a service for all.

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