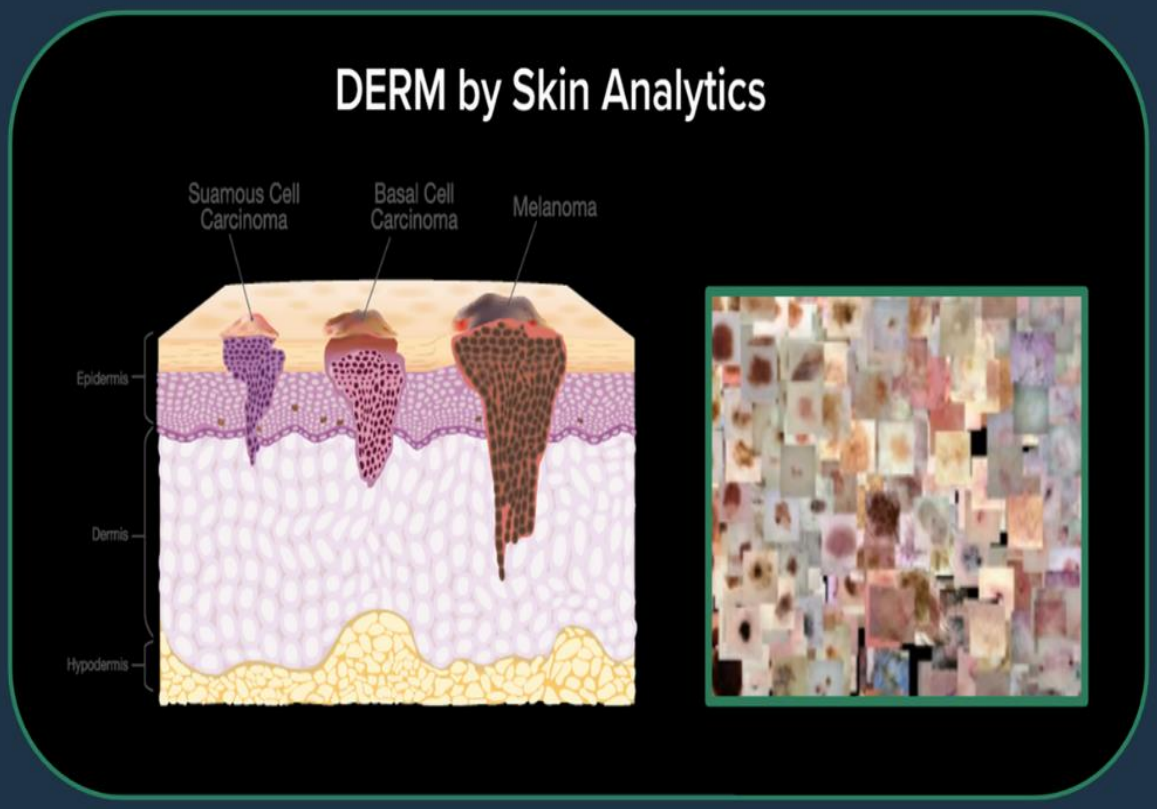
Skin Analytics – helping more people survive skin cancer

Unique AI-supported diagnostic aid augmenting the role of the dermatologist



Jeremy Cox, Founder CX-Create

Sponsored by Oracle for Startups program

CX-Create

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About this report

Based on interviews with Neil Daly, founder, and CEO, this brief report introduces Skin Analytics, one of a growing number of highly innovative companies supported by the Oracle for Startups program. Founded in 2012, this company has significantly improved the triage process for skin cancer, relieved the pressure on primary and secondary care services, and helped more people to survive skin cancer. After several years of training, optimizing, and validating their machine learning algorithms, Skin Analytics launched its cloud-based AI diagnostics platform, DERM, in 2020.

The theme for this month is startups in the healthcare sector and how they are innovating, changing the competitive landscape, and contributing to significant improvements in healthcare using modern cloud and AI technologies.

CX-Create is an independent IT industry analyst and advisory firm, and this report is sponsored by the Oracle for Startups program team.

Highlights:

- Deaths from skin cancer continue to rise, but the capacity to diagnose and treat skin cancers cannot keep up with the demand
- Skin Analytics can accelerate and improve skin cancer triage
- Live services using DERM have successfully assessed more than 16,000 patients
- DERM – Deep Ensemble for the Recognition of Malignancy augmenting the roles of dermatologists and primary care clinicians
- Advantages of the Oracle for Startups program go beyond favorable discounts for OCI

The business context for Skin Analytics

Deaths from skin cancer continue to rise, but the capacity to diagnose and treat skin cancers cannot keep up with demand.

We have become more aware since the 1980s of the risks of skin cancer from prolonged exposure to the sun's harmful ultraviolet radiation, in part from public education and frequent advertising by sunscreen manufacturers. According to the World Cancer Research Fund/American Institute for Cancer Research, Australia still has the highest skin cancer rates globally, with 33.6 per 100,000. There are several reasons for this. Its proximity to the hole in the ozone layer. (The ozone layer protects us from the worst of the sun's radiation); a primarily white population that is more susceptible to harmful radiation; and a population that enjoys a

high level of outside social and sporting activities leading to frequent and prolonged exposure to harmful UV.

But the prevalence of skin cancer is not contained to the southern hemisphere. The largely fair-skinned Scandinavian countries of Norway (29.6), Denmark (27.6), and Sweden (24.7) also have relatively high rates in comparison with Italy and Canada (12.4) and the US (12.4). Despite the lower rate in the US, the Skin Cancer Organization states that one in five Americans will develop skin cancer by seventy.

Skin cancer is categorized as non-melanoma and melanoma. Non-melanoma occurs in the upper layer of the skin, the epidermis, and is primarily made up of two types: basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). These are easily treatable if caught early, usually by surgical removal, and they do not tend to spread to other parts of the body. The more severe melanoma and rarer Merkel cell carcinoma (MCC) can spread to other parts of the body through the lymphatic system. If diagnosed early (stage 0 or 1), they can be surgically removed. Treatment may include immunotherapy, radiotherapy, and chemotherapy at the more advanced stages.

Patients with a suspicious skin lesion are usually referred by their doctor to a dermatologist, who in turn may request a surgical procedure to take a small piece of tissue from the lesion, which is examined by a pathologist under a microscope, to make an informed diagnosis. Only a small percentage of skin lesions are diagnosed as cancerous and need treatment, but as we become more aware of the dangers of prolonged exposure to the sun, the demand for dermatological consultations and pathology services have grown.

The main problem is that specialist dermatological capacity has not kept pace with demand. Over 470,000 patients are placed on the 'urgent two week wait' treatment pathway to find only 16,000 melanomas every year in the UK alone. Improvements in teledermatology have made it easier to carry out consultations remotely, and other technologies exist to help clinicians decide whether a skin lesion is problematic or not. However, these are often expensive and require specialist training.

The use of AI to automate diagnosis is still in its early stages, but it has the potential to reduce the diagnostic burden of skin cancer and ultimately ensure more patients get the treatment they need. Skin cancer rates are doubling in the UK every 10-15 years, and about 30% of dermatology posts in the National Health Service (NHS) are unfilled. Of those filled positions, nearly a third are by locums.

Skin Analytics - the story so far

The start

Skin Analytics was founded in 2012 by Neil Daly having spent the better part of the year before trying to understand why so many people died of skin cancer when the first signs of it are right there on the skin for us all to see. He felt that the nascent AI field could be applied to the analysis of skin lesions and sought funding to get the business started. It became apparent that he would have to give up his jobs to concentrate on the business full time. This was a considerable risk at a time when the acronym AI was barely recognized. Several months of

fundraising followed by a grant from the Technology Strategy Board, a UK government innovation investment organization, provided further impetus.

Misplaced advice and a foray into consumer skincare almost derailed the company

Given the highly regulated environment of healthcare, any solution would need to jump significant hurdles. Recognizing this, Daly sought expertise from leading dermatologists. This helped him understand the various pathways patients took for skin cancer treatment. However, he was advised to leave the diagnosis to the experts and instead concentrate on using computational diagnostics to identify changes in lesion images over time, a leading indicator of skin cancer. Skin Analytics developed machine learning models to focus on these image changes, but no one was willing to pay for the service, despite its effectiveness.

In search of an income, the team won a competition run by Unilever to apply AI in the field of skincare focused on analyzing the degree of dry skin. While their solution proved more accurate than Unilever's experts, customers with dry skin simply turned to moisturizer. Big plans for a launch in multiple countries had to be shelved.

Skin Analytics 2.0 - the company returns to its original idea, this time with greater AI firepower

Fortunately, aided by some original investors, Daly hired an expert in computer visualization and deep learning, Dr. Jack Greenhalgh, as AI Director. His impact was immediate, and the firm refocused its efforts on a solution that could help clinicians diagnose skin cancer. This resulted in DERM – Deep Ensemble for the Recognition of Malignancy.

> 'We are committed to our mission to improve patients' lives and do it in a way that is sustainable to healthcare systems around the world.'
>
> Neil Daly, CEO Skin Analytics

AI is trained using relevant skin lesion datasets and expert analysis

The deep learning algorithm used in DERM by Skin Analytics has been purpose-built from the ground up to assess skin lesions. This enables a highly accurate diagnosis of the most common cancerous, precancerous and benign skin lesions.

Every attribute of the machine learning architecture has been optimized to solve a specific problem. As a result, DERM image recognition is substantially more accurate than general-purpose AI-supported image recognition solutions.

A clinical study validates the efficacy of DERM

To validate the solution's performance and meet regulatory compliance, the company undertook the first-ever powered prospective clinical study for AI in dermatology, under the management of Clinical Research Director Dr. Helen Marsden. Between 2017 and 2018, 514 patients with at least one skin lesion due for biopsy were recruited from dermatology and plastic surgery clinics across 7 UK hospitals. Over 1,500 lesions were included in the study, which showed that DERM was at least as accurate as skin cancer specialists in identifying melanomas, the most lethal of

skin cancers. Over half of the melanomas included were in the earliest stages of the disease, indicating that the algorithm could play a role in detecting thin or early-stage lesions.

The study was published by JAMA Network Open, and offshoot of JAMA (JAMA Network Open. 2019;2(10):e1913436. doi:10.1001/jamanetworkopen.2019.13436).

Solution overview

DERM – Deep Ensemble for the Recognition of Malignancy augmenting the roles of dermatologists and primary care clinicians.

The DERM AI diagnostic platform, a class 1 device, acts as a decision support tool helping clinicians and dermatologists identify potential skin cancers. Early detection saves lives.

DERM ingests dermoscopic images and analyzes each image for multiple skin lesions. When detected, a suspect classification is generated providing the clinician or dermatologist with additional information to help them decide on the best course of action for the patient.

The Skin Analytics system also enables local dermatologists to review referred cases remotely, allowing them to direct patients to the best assessment or treatment option. DERM can be deployed in hubs, in primary and secondary care and by insurance providers like Bupa and Vitality.

The goal of DERM is to augment, not replace, the dermatologist's role. It is an effective aid to decision-making and early detection, while the dermatologist decides on the most appropriate treatment for the patient.

Flexible access to DERM supporting the local doctor, care hubs, and dermatologists

In partnerships with the NHS, Vitality, and Bupa, and despite Covid-19 interruptions, Skin Analytics launched the world's first AI skin cancer clinical pathway with their NHS partners in April 2020. Having been deployed in Mid and South Essex Health and Care Partnership and University Hospitals Birmingham, DERM, is relieving the pressure on primary and secondary care services while helping more people to survive skin cancer. The Skin Analytics research-led approach and published studies have gone a long way to overcome initial skepticism, and the company is now gaining recognition.

Increasing recognition and successes

In March 2020, Skin Analytics was ISO 13485:2016 certified. ISO 13485:2016 is an internationally recognized quality standard for medical devices and a prerequisite for registration as a class II medical device under the European Medical Device Regulation (MDR). This accreditation represents another critical milestone for the company and its mission to help more people survive skin cancer.

There are now several ways DERM can be accessed within the UK healthcare sector: In primary care, supporting a GP to decide whether or not to refer the patient, and in community care hubs where nurses can take images and have them reviewed by DERM before referring patients to a dermatologist.

Skin Analytics Receives NHSX Award for AI-based skin cancer tool

Off the back of Skin Analytics' intense focus on research and successful early deployments, the company received the NHSX award for AI-based skin cancer tools. The NHSX is a joint unit of NHS England and the Department of Health and Social Care, supporting local NHS and care organizations to digitize their services, connect health and social care systems and transform how patient care is delivered, at home, in the community, and in hospital settings. Following the NHSX award, it is expected that the benefits seen in current deployments will be shared across the NHS through further deployments. This would potentially expand access to the DERM platform to thousands of clinicians and millions of patients.

CW Innovation announces partnership expansion with Skin Analytics in February 2022

CW Innovation, a joint program between CW+ (the official charity of Chelsea and Westminster Hospital NHS Foundation Trust) and the NHS Trust. The innovation program partnership will evaluate the impact of DERM in real world settings. It will evaluate DERM's impact on relieving pressure on services, and faster and earlier skin cancer detection. DERM can also be accessed remotely supporting teledermatology hubs in secondary care. By identifying non-cancer referrals quickly, dermatologists can relieve patient anxiety and focus on patients in need of treatment.

Current go-to-market

Skin Analytics' highly qualified and experienced team has developed the ensemble machine learning algorithm over many years of research, publishing findings in relevant journals and validating the results through trials at several NHS hospitals. The management team consists of AI, medical and regulatory compliance experts. This has provided a strong foundation of credibility. Having won the respect of clinicians and dermatologists, the company has expanded its reach through partnerships, both with NHS hospitals and private healthcare providers.

Future direction

What to expect – expansion into the US

Our interview with Daly took place, as most do, via Zoom. Daly was speaking from the US, where he is setting up a Skin Analytics office. The awards and certifications position the firm well for fast-tracking DERM through the FDA's Breakthrough Devices Program. Currently, teledermatology in the US relies on clinicians manually examining high-quality images of skin lesions. The potential for Skin Analytics is substantial if it can successfully navigate US health regulations. It is also likely to attract significant investment, especially once FDA approval is forthcoming.

Advantages of the Oracle for Startups program go beyond favorable discounts for OCI

Skin Analytics joined the Oracle for Startups program in 2020. In addition to the highly favorable two-year discount rates on Oracle Cloud Infrastructure (OCI). Security and scalability of OCI were also attractive to Skin Analytics. However, according to Daly, the most significant advantage of its connection with Oracle lies in the future. With its global presence and deep involvement with the healthcare industry, the Oracle network should yield valuable introductions, especially as Skin Analytics seeks to establish a foothold in the US. Meanwhile, the experience with Oracle for Startups has been very positive and responsive.

CX-Create's viewpoint

The future looks very bright for Skin Analytics

Skin Analytics is working to solve a major problem. It has already proven itself in the UK and has a healthy mix of healthcare-related and advanced technical expertise and experience. Despite nearly being sidetracked in the early days, its disciplined research-led approach to platform development supported by guidance from experienced investors*provides a tremendous foundation for growth. Once the FDA approval is in place, Skin Analytics has an early advantage in AI-enabled diagnostics, giving it a head-start in the US market and beyond.

* Investors: Polar Light Ventures Ltd, a Switzerland-based early-stage VC, and Hoxton Ventures in London. Michael Buchen of Polar Light Ventures and Hussein Kanji, partner at Hoxton Ventures, are represented on the board of Skin Analytics.

Summary details

Table 1: Fact sheet

Solution name	DERM	**Solution category**	AI-enabled teledermatology
Key industries	Healthcare	**Geographies**	UK, Australia currently, US imminent
Deployment model	SaaS	**Licensing basis**	Subscription
Size of organizations served	From small primary care to large hospitals, in both public and private sectors	**Go-to-market model**	Direct
Number of employees	41 + 4 board advisors	**Key partnerships:** - **Healthcare providers** - - **Technology**	NHS University Hospital Birmingham NHS Foundation Trust, NHS Cambridgeshire & Peterborough Clinical Commissioning Group, Mid & South Essex Health and Care Partnership, Bupa, Vitality Oracle for Startups
URL	https://skin-analytics.com/	**HQ**	London, UK

Appendix

- Aindra Systems - democratizes healthcare in India
- HEARTio. – smarter cardiac triage
- PRORADIS - shortens distance and time improving patient care in Latin America through innovation
- Sensei Ag - .improving human nutrition
- Sensei Retreats – takes a science-led approach to health and wellbeing.

To explore more startups supported by the Oracle for Startups program, follow this link, and under categories select Startups and Scaleups for innovation, sub-category: Oracle for Startups.

About CX-Create

Jeremy Cox founded CX-Create Limited in January 2021, a former principal analyst at Omdia (formerly Ovum) focused on customer engagement strategies and platforms.

He is recognized by major CX vendors, clients, and former colleagues as a leading thinker in customer experience and engagement. Formative experiences in the 1990s at IBM convinced him of the critical importance of understanding the business world from the outside in. These insights were put to practical use in his former roles as a principal CRM consultant at KPMG Consulting and as an independent consultant supporting public and private sector organizations.

Our mission

CX-Create's mission is to help enterprises and the vendors and startups that serve them remain relevant. The company's primary focus is to track and understand the constantly evolving customer experience world and share those insights with clients. Continuous innovation is also an essential component of persistent customer relevance, directly and indirectly, which is why we are enthusiastic about startups and the Oracle for Startups program.

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