THE ART OF SOFTWARE DESIGN IN DERMATOLOGY AND AESTHETIC MEDICINE

An interview with Marius Khan

BY JANE YOO, MD

Jane Yoo, MD, a dermatologic surgeon in private practice, sits down with Marius Khan, a computer scientist, entrepreneur, and cofounder of avisé labs, and talks about the emerging role of artificial intelligence in the dermatology and aesthetic spaces.

You are one of the founders of avisé labs. Why did you found it, how did it evolve, and what is your company's goal today?

In 2017, we had first thoughts about bringing AI into dermatology and disrupt that industry with new diagnostic software tools. Back then, AI was not as intensely discussed like today. It was a hot topic within computer science, but it was just way too far away from physicians. Dermatology also seemed like a good use case since research has shown good results with image processing using neural networks in that field. It was promising to start. We quickly realized that we can adapt our work to other medical domains. Today, we are an international software company developing software projects in the medical and life sciences domain (through management systems and diagnostic tools for industry and research).

You said back then AI was not so present everywhere like it is today. What changed especially in dermatology and aesthetic medicine?

We realized that the mindset of our clients (companies, clinics, and

institutions) changed drastically. Our clients are way more open-minded than seven years ago when it comes to applying AI, because they can see with the big rise of large language models (LLMs) like GPT-4 the possibilities of what can be done already today. Also, we are not talking about lab-only use cases anymore. We get more client requests where they don't only want to have a machine learning (ML) training model that is typically only used by a computer scientist, but can also be used in a production environment. That means we need to integrate the ML models into new or existing software landscapes, such, as the Amazon Web Services (AWS) cloud platform, and provide user friendly interfaces (web applications).

Can you give an example of an innovative, AI-related topic that you currently work on in dermatology?

Currently, we are working in the field of AI-based retinal analysis for dermatological diseases. The use of AI in dermatology, specifically in the analysis of skin conditions based on retinal images, is an emerging area of research, and we are also exploring this area for the industry. While the majority of the existing research has focused on the application of AI in retinal image analysis for ocular diseases, there is a growing potential for its use in dermatology.

For instance, we would like to analyze retinal images to detect skin issues/diseases more precisely.

Where do you see big chances for AI in dermatology and aesthetic medicine?

This [aesthetics] field is great for launching new projects, thanks to its proximity to cosmetic companies and sponsors. Being closer to cosmetics, not core medicine, makes regulations simpler, allowing faster testing of prototypes. The visual connection is beneficial for AI processing, especially

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when combining images with patient data. With the rise of new publicly available LLMs and GPT Stores, developing AI systems is quicker. Companies are retraining already existing LLMs and customizing their chatbots.

Given the shortage of employees, efficient processes are crucial, especially in dermatology and aesthetic medicine. So, it's not just a choice but a necessity to adapt and progress in these directions.

What is the biggest problem when it comes to applying AI in dermatology/ aesthetic medicine in general?

Designing complex software solutions was always art for me. And now in the era of AI there is even more art

in designing these extremely complex software solutions for such a demanding medical domain.

Additionally, AI has the potential to acquire incorrect information, raising the critical question of how to rectify and de-learn algorithms when they assimilate erroneous content. This challenge is evident in experiences with ChatGPT and similar bots, where instances of hallucination can have significant adverse effects, particularly in medical contexts. Even seemingly benign recommendations, such as advising on the precise location for a Botox injection, can yield undesirable outcomes. The regulation of self-learning machine learning algorithms, especially those closer to the realm of medicine than cosmet-

ics, poses a formidable challenge. While prioritizing patient safety and security is paramount, navigating regulatory hurdles becomes particularly vexing from an innovation standpoint, often impeding progress in this rapidly evolving field.

You think regulation is the showstopper for innovation?

Stakeholders of an innovative AI project can work on regulation. It is more a question about what kind of strategy you take. And eventually you cope with it, once you have it on the page at the very beginning of the project.

An impediment to innovation, in my view, arises when major industry players fail to collaborate with agile start-ups and small businesses. Closer partnerships between these entities are crucial. Drawing from our positive experience in Silicon Valley, it would be beneficial for large players, especially in the European Union, to embrace openness toward emerging companies. Small businesses don't necessarily require funding for innovative AI projects solely from governments or major corporations; rather, what they need are meaningful collaborations. Assignments and partnerships are essential for their growth, fostering a healthier trajectory and enabling a move toward independence, reducing reliance on venture capital.

With those collaborations, access to data pools could be more efficient for AI projects, since AI needs to be trained on millions of datasets. How can the process of acquiring and processing data for ML algorithms in medicine become more efficient?

To enhance the efficiency of ML algorithm training for physicians, it is imperative to establish standardized data pools integrated with automated and tailored AI pipelines. This eliminates the necessity of hiring software engineers, making the process more accessible for medical professionals. For instance, we are presently developing an infrastructure for a client so he can offer his internal diverse departments a centralized data pool and an additional automation layer. The automation layer ensures that data is automatically prepared for upcoming AI-training sessions. The ultimate aim is to empower physicians to effortlessly configure their specific use cases, even if they lack extensive background knowledge in AI.

So, would you say that acquiring data is the most important aspect of an innovative AI project?

Yes, absolutely. Acquiring enough of the right data. We have seen plenty of research projects where the idea was so great and innovative but the project failed because it could not collect enough medical data that could be used to train AI algorithms.

Do you think AI systems will take over in future when it comes to diagnosing in dermatological procedures and applying cosmetic procedures?

AI systems possess the unique ability to attentively analyze and comprehend patient information for extended periods, in stark contrast to doctors constrained by brief 10-minute time slots. With the capability to process vast amounts of multimodal data over hours or days, AI systems can accumulate substantial experience. Also,

it is surprising how empathetic AI systems are today, especially in medical conversations with patients. And, keep in mind that models like GPT-4 were not explicitly trained on medical data or use cases. Nevertheless, at avisé labs, our experience underscores the indispensable role of a doctor in the loop, particularly in aesthetic contexts where matters of taste heavily rely on interpersonal interactions. Despite the advanced capabilities of AI, the nuanced and subjective nature of aesthetic considerations necessitates the human touch of a qualified physician. Therefore, the optimal approach entails a synergistic combination of AI and a doctor to ensure comprehensive and personalized healthcare solutions.

You are right at the crossroad of computer science and medicine, and thus your projects must be massively interdisciplinary. How do you get along with people in other disciplines?

Our projects have been a dynamic and enriching experience. Engaging with diverse and sharp individuals has proven to be immensely rewarding, fostering a continuous exchange of ideas. The inherent diversity in perspectives not only fuels stimulating conversations but also opens avenues for perpetual learning. Moreover, the agile development loops, particularly in relation to the human-computer interface of our software, have proven instrumental. These iterative processes enhance the adaptability of the developed software and contribute significantly to the seamless integration of insights from both fields, resulting in innovative and impactful outcomes. ■