From bioscience to skin care, startups are harnessing AI to solve problems big and small

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Category

Digital Transformation

It started with a trek to one of Europe's most remote areas.

Fascinated by the biodiversity of the world's less-explored environments, biologists and explorers Glen Gowers and Oliver Vince spent a month on an ice cap in Iceland in 2019 undertaking

what is believed to be the world's first fully off-grid DNA sequencing expedition. Using solar power alone, the team spent a month sequencing DNA from microorganisms living in an area with both ice and a hot spring. Sequencing DNA refers to a method used to "read" the genetic code of an organism.

Philipp Lorenz. (Photo courtesy of Basecamp Research)

After returning to the U.K., the pair shared their data with Philipp Lorenz, a University of Oxford scientist whose research focuses on genomics and AI. It quickly became apparent that the data they had collected was unlike anything they had seen in any reference database — so different, in fact, that the sequences couldn't be annotated using traditional methods.

That realization prompted Gowers and Vince to launch Basecamp Research, a London-based startup that aims to build the world's largest database of natural biodiversity and apply AI and machine learning to advance bioscience. The company is among a wave of startups worldwide that are harnessing machine learning and artificial intelligence, particularly generative AI, to create AI-powered tools and solutions across an increasingly large swath of industries.

Pointing to the lack of data in the life sciences, Lorenz says there are 10 to the power of 26 species on the planet, but only a few million of those have been sequenced. “In terms of comparison, that’s about five drops of water compared to the Atlantic Ocean of what we don’t know about life on Earth,” says Lorenz, chief technology officer at Basecamp Research.

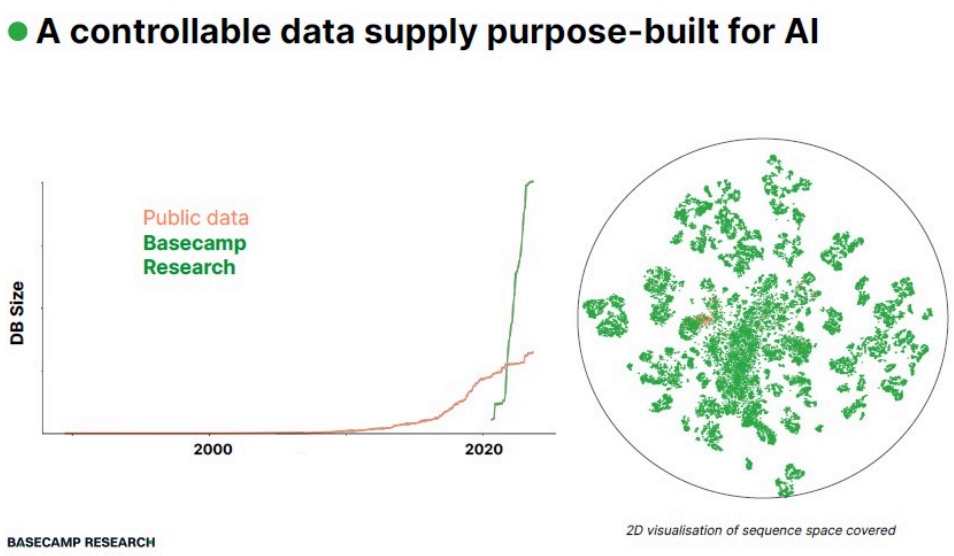
“If you want to do deep learning on biological data, there’s just a fundamental, enormous knowledge gap.”

Basecamp Research works in some of the world’s most biologically diverse and understudied areas. (Photo courtesy of Basecamp Research)

To bridge that gap, Basecamp Research is partnering with nature parks on five continents and working across 27 countries to sequence genomic information from the world’s most diverse and understudied biomes — from volcanic islands and deep oceans to jungles and the Antarctic.

The company, which has close to 35 employees, collects samples only with consent from stakeholders including national and local governments, nature parks, research institutes and landowners. Basecamp Research shares benefits with stakeholders, such as employing local scientists, providing training and resources to partners, and sharing revenue if commercial products are developed from the locations Basecamp Research is working in.

"We are the first company, really in the world, that is doing this at scale and collaboration with stakeholders," Lorenz says. "In the age of generative AI, we are the only life science organization that can train AI models in which every point in the training dataset can be traced back to consent and benefit-sharing agreements."



Basecamp Research was launched to build the world's largest database of natural biodiversity and use AI to advance bioscience. (Image courtesy of Basecamp Research)

In just two years, he says, Basecamp Research has built a database about five times larger and more diverse than any other of its type. Unlike traditional protein databases that primarily just store data, Basecamp's database is a "knowledge graph," a network that organizes data and shows the relationships between billions of data points, linking protein and DNA sequences to their biological, chemical and evolutionary contexts.

In March, Basecamp Research announced the launch of a new deep learning model named BaseFold. The model can predict 3D structures of large proteins and small-molecule interactions with protein targets more accurately than the popular AlphaFold2 model, according to Basecamp.

With its database, Basecamp Research is building deep learning models that are being used to design products such as gene

editing systems for therapeutics and enzymes for food manufacturing. One client is developing proteins that break down difficult-to-recycle plastic waste. Another company is designing proteins for dyeing fabrics without using harmful chemicals.

Basecamp Research, Lorenz says, is motivated by a mission of ethical data collection and a core belief in the power of AI to advance biological discovery.

"Biology and the life sciences are just fundamentally more complex than most other domains," he says. "Ultimately, it's going to be deep learning models and AI that will be able to deal with and understand the vastness and complexity of biology."

Helping startups succeed

Microsoft for Startups Founders Hub was launched in 2021 to accelerate innovation by providing access to resources that were traditionally unavailable to fledgling companies. Open to any startup, the platform provides access to leading AI models, Azure credits, free and discounted development tools, and expert guidance. Tens of thousands of startups around the world are now part of Founders Hub, and the number of those companies using Microsoft AI has increased tenfold in the past year, according to Microsoft.

Microsoft for Startups Pegasus Program, an extension of Founders Hub launched in 2023, is an invite-only program that connects growth-stage startups with Microsoft customers in industries including AI, retail, health and life sciences, and cybersecurity. The program matches Microsoft's top enterprise customers with the right startups to help them solve business challenges.

Microsoft's focus on integrating AI into its products, from GitHub to Microsoft 365, is a differentiator and means startups not only

get access to those tools but also to the expertise behind them, says Tom Davis, partner at Microsoft for Startups.

"It's not just access to infrastructure, extra Azure credits and things like that," he says. "It's access to knowledge and know-how that will help accelerate these startups. That understanding of how to build AI-based product applications is invaluable for startups."

'True proactive health care'

Tammy McMiller joined Founders Hub not long after launching her company, Plan Heal, in 2022. Based in Chicago, Plan Heal offers AI-powered solutions that enable patients to monitor and report health metrics so care providers can better serve them.

Tammy McMiller. (Photo courtesy of Plan Heal)

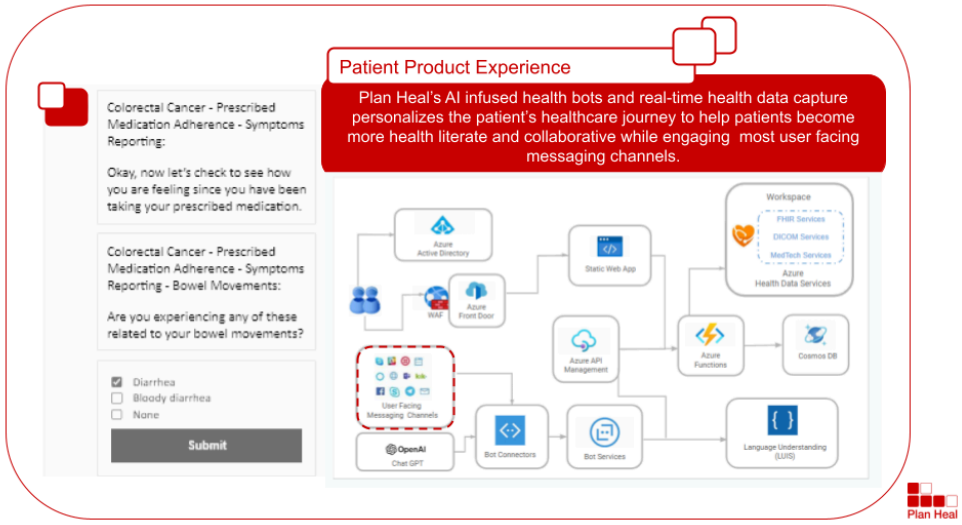
The company's mission of empowering patients and providers is a personal one for McMiller. She decided to start the company after a family member who had complained of symptoms for more than two years and was regularly seeing her doctor was diagnosed with stage three colorectal cancer.

McMiller's relative has been cancer-free for nine years, but she points to statistics showing that 167 million people in the U.S. have health issues such as high blood pressure, kidney disease or diabetes but don't know it.

"My family member was one of those statistics," McMiller says. "What that means is that people are living lives with a lower quality of health and not really understanding why. We decided to leverage AI to help people become better reporters of their health."

Through Plan Heal's Smart Health Assessment, which is powered by Azure and integrates with electronic health record systems to help teams access real-time patient data, patients answer a few questions about their health on a regular basis and can upload images of symptoms or medications.

Algorithms analyze the data to provide insights and flag potential health issues for providers. Cramping or aching in the calves, for example, can indicate peripheral artery disease in a patient with diabetes, which can lead to amputation; a limb is amputated every three minutes and 30 seconds in the U.S. due to diabetes.



Plan Heal's platform enables patients to monitor and report on their health so providers can be more proactive and better serve them. (Image courtesy of Plan Heal)

Those insights allow providers, who often have high caseloads and limited time with patients, to go into appointments with more information about a patient's health and proactively come up with preventative treatments.

"It really changes the dynamic from a disease care interaction to true proactive health care," says Dan Langille, a member of Plan Heal's advisory board. "That's pretty powerful."

Plan Heal's platform also offers targeted assessments for several high-cost, chronic diseases including diabetes and kidney disease. McMiller hopes to pilot the platform with a large-population health care provider this year, and early results seem promising. Testing found that 90% of patients who used the health assessment had a more engaging conversation with their provider, she says, and 85% received care services they would not have otherwise, such as additional examinations or tests.

As an aging population increases the demand for health care services, McMiller says, AI can play a valuable role in helping people track their health and identify potentially life-threatening conditions earlier.

"We'll always need professional health care teams. AI's never going to replace that," McMiller says. "But if that care team member has the efficiency of AI to help automate different services, they can care for patients more efficiently."

Generative AI for skin care

In 2018, Anastasia Georgievskaya was a research scientist working with R&D teams at skin care companies to develop models for analyzing skin in a clinical setting. The work involved analyzing before and after images of skin that would show benefits from skin care products — contrary to what some consumers believed, she says.

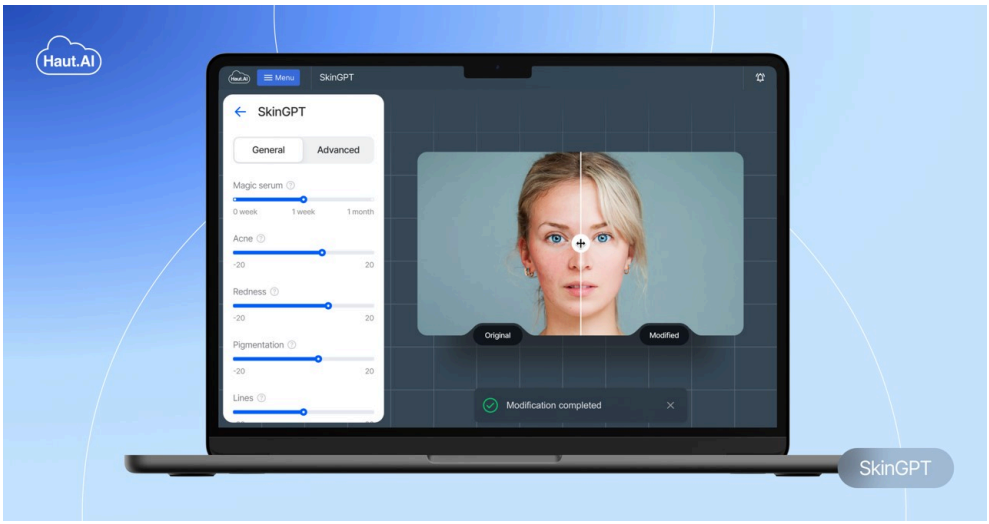
Anastasia Georgievskaya. (Photo courtesy of Haut.AI)

“We started to ask people in the industry, why does everyone think that skin care is not working?” Georgievskaya says. “And the answer was that it’s working, but consumers are choosing the wrong product and buying products that were not designed for them.”

That got Georgievskaya thinking about using AI and computer vision to replicate on smart phones the analysis she was doing in labs. If consumers could get accurate skin assessments easily through their phones, she reasoned, they could make more informed decisions and get better results from skin care products.

Georgievskaya co-founded Haut.AI, a company based in Tallinn, Estonia, in 2018 to provide skin care companies and retailers with customizable, AI-based skin diagnostic tools. Haut.AI’s software uses selfies from consumers to assess skin metrics such as hydration, redness and wrinkles, then makes personalized product recommendations. A similar application analyzes hair condition,

also through a selfie, to gauge features including frizziness, volume and color uniformness.



Haut.AI provides customizable, AI-based skin diagnostic tools. (Image courtesy of Haut.AI)

Haut.AI's newest product, SkinGPT, lets users upload photos and see how their skin would change over time when using particular products, like face serum with hyaluronic acid for fine lines and wrinkles; the company says the application is the first to use generative AI for skin care simulations. Haut.AI is also working on a chatbot that can provide consumers with input on skin analysis results and answer questions about ingredients in products or how to combine products.

The platform's algorithms are trained on a mix of lab data from anonymized images of human skin and synthetic data created with generative AI. Datasets in the beauty sector are limited, Georgievskaya says, and using synthetic data allows Haut.AI to train models to account for gender and population group differences, and environmental factors like air pollution and weather that can impact skin condition.

"This blend of synthetic and real data gives a really impressive boost in system accuracy because it can cover a lot of use cases, especially for the groups that you don't usually have much of a dataset for," she says.

Haut.AI co-founders Anastasia Georgievskaya and Konstantin Kiselev. (Photo courtesy of Haut.AI)

Haut.AI, which is part of the Microsoft for Startups Pegasus Program, has around 90 clients, including several that are using its technology for research and development, Georgievskaya says. The platform allows companies to collect data from thousands of study participants with their consent, she says, versus the traditional approach of bringing a few dozen participants to a research facility for testing.

Artificial intelligence, Georgievskaya believes, can provide a more objective and realistic analysis of skin than a person possibly could.

"As humans, it is in our nature to be emotional, and we tend to underestimate or overestimate our skin," she says. "And even if someone else tells you something about your skin, if they're not a doctor, their judgment is also very biased and subjective. The algorithm helps you see objective measures. You can just snap a selfie and get this information in less than 10, 20 seconds."

A platform for AI developers

While many startups are making products powered by AI, Weights & Biases' mission is to provide tools to help AI developers build those solutions. Founded by Lukas Biewald and Chris Van Pelt, the San Francisco-based company arose out of an internship Biewald had at OpenAI in its early days as a research organization.

Chris Van Pelt. (Photo courtesy of Weights & Biases)

While at OpenAI, Biewald struggled to find a way to track his experiments. He asked other researchers what they were doing and found a hodgepodge of approaches, from keeping notes in a text editing app to creating Excel documents. There was no uniform way to track the different experiments going on and their performance.

"We saw an opportunity, and really an itch that we had ourselves and wanted to scratch," Van Pelt says.

Biewald and Van Pelt, who previously founded machine learning and AI company Figure Eight, launched Weights & Biases in 2017 to provide tools to help AI developers better manage workflow and build and deploy models faster. The company's platform, which runs in Azure, allows users to track and visualize experiments, store models in a central registry, automatically capture the data and code used for models and share results with collaborators.

Weights & Biases' platform was created to help AI developers better manage workflow and deploy models faster. (Image courtesy of Weights & Biases)

Demand for the platform has grown, Van Pelt says, since the release of ChatGPT has made it easier to build general-purpose large language models that can perform many tasks without requiring different models.

"That really changed the dynamic," he says. "The number of people that we could help with our tools went from a fairly small subset of engineers who were specialized in machine learning to essentially all engineers. Our customer base expanded dramatically."

The company, which is a member of the Microsoft for Startups Pegasus Program, has more than 1,000 customers across sectors ranging from tech to finance, health care, medicine, robotics, the automotive industry and academia (Weights & Biases gives its software to academics for free). OpenAI is a customer, as is Microsoft. The company's platform is being used to fuel drug discovery, advance autonomous vehicle development and improve health care delivery.

The Weights & Biases team gathers during a conference. (Photo by Chloe Jackson)

For Van Pelt, seeing the diversity of Weights & Biases' customer base and the innovative ways customers are using its technology is one of his favorite aspects of the company.

"I think every founder or person working on a startup wants to think that what they're doing is going to change the world," he says. "I'm not making any big claims that Weights & Biases is changing the world.

"But we do have a front-row seat [to watch] all of our customers that are doing things that we simply could not do before, and we're helping them to do that. It's really gratifying to see."

Top photo: Biologists Glen Gowers and Oliver Vince, pictured here, launched Basecamp Research after a 2019 expedition to an ice cap in Iceland. (Photo courtesy of Basecamp Research)

AI Cloud Customers