



eWEAR-X Annual Report

Stanford | e_wear-X

Stanford Wearable Electronics Initiative

2025

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eWEAR-X Mission

$$\text{e} \text{wear} - \text{X} = \text{e} \text{wear} + \boxed{\begin{array}{c} \text{Chen} \\ \text{IPL} \end{array}}$$

The Stanford Wearable Electronics (eWEAR-X) Initiative is a center for multi-disciplinary expertise in engineering, medicine, and data science to enable the success of students, faculty, and collaborators in translational projects related to Embodied AI. Embodied AI comprises systems and interfaces by which AI interacts with the physical world for sensing, movement, manipulation, and communication. Embodied AI includes sensing as input for AI interpretation and instructions on action. Stanford U. is at the forefront of translational research at the intersection of technology, data science, and human health. eWEAR-X fosters breakthrough applications leading to future wearable solutions for the better health, life, and community.

eWEAR-X aims to...

Empower faculty, students, and industry to achieve sensing systems that provide high-quality data.

Enable Embodied AI with future generations of wearables, implantables, medical robots, assistive devices, precision health, and remote health care.

Connect leaders and innovators in industry and more than 80 research groups at Stanford U. to work together and convene at events to share ideas and foster opportunities.

Accelerate emerging technology from academic discovery to impactful solutions through prototyping assistance, seed project awards, entrepreneurship Health Prize competition, and expert guidance.

Applications for Embodied AI range from:

- e-Skin (electronic skin)
- Health monitoring
- Disease detection
- Robotic interfaces
- Neural interfaces
- Biosensors
- AI-insights from sensor data
- Drug/treatment delivery
- Human clinical trials
- Implantable electronics
- AR/VR
- Displays
- Hearables
- Edge computing
- e-Textiles
- Internet of Things
- Smart cities
- Driverless cars



*Prof. Zhenan Bao
Faculty Director*



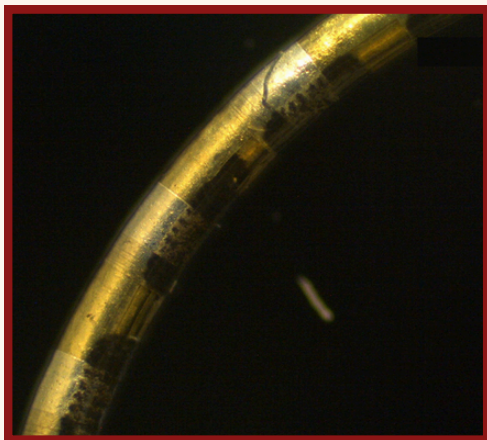
*Prof. Xiang Qian
Co-Faculty Director*

Wearable electronics combine sensors and wireless communications to allow remote collection of vital information and more seamless human interfaces with technology. User-centric design and systems-level approaches are applied to create devices that are flexible and comfortable to wear while providing more accurate data. eWEAR-X encourages the development and use of AI for insights from wearables that benefit humanity.

Soft Bioelectronic Fiber Can Track Hundreds of Biological Events Simultaneously

By Andrew Myers

Developed by Stanford researchers, NeuroString is a hair-thin multichannel biosensor and stimulator with promising potential applications in drug delivery, nerve stimulation, smart fabrics, and more.



The NeuroString is just a quarter of a millimeter in diameter – about the width of a human hair – and can host hundreds to thousands of independent electronic channels that could be used to sense, stimulate, or monitor parts of the human body. | Courtesy Bao Lab

Stanford pediatric surgeon [James Dunn](#) specializes in helping children with short gut syndrome, a congenital disease in which children are born with short intestinal tracts. “I’ve been working to grow new intestinal tissue by applying a mechanical force to the intestine – stretching it,” Dunn, who is a professor of surgery in the [School of Medicine](#), explained. “But I didn’t have a way to demonstrate that this new tissue is functioning exactly like normal intestine.”

That is when Dunn reached out to [Zhenan Bao](#), the K.K. Lee Professor of Chemical Engineering and director of the [Stanford Wearable Electronics Initiative \(eWEAR\)](#), who has drawn worldwide attention for developing skinlike electrical circuits, like her electronic [skin](#) that can sense the weight of a butterfly and the heat of a

flame. The result of their collaboration is NeuroString, a multichannel, soft, thread-like implantable biosensor/stimulator.

NeuroString is just a quarter of a millimeter in diameter – about the width of a human hair – and can host hundreds to thousands of independent electronic “channels,” each of which can sense neurochemicals, stimulate muscle or nerve, sense gut movement patterns, or monitor the activity of a single neuron, among many other promising possibilities. The team details its NeuroString work in [the latest issue](#) of the journal Nature.

Unmet needs

“There is great need, in both research and clinical settings, for these minimally invasive sensing and stimulation bioelectronics,” said co-author [Xiang Qian](#), co-director of Stanford’s [eWear Initiative](#) and a medical doctor who specializes in neuromodulation to treat severe pain. Currently, clinical tools boil down to rigid and bulky needlelike probes or stiff wires with limited functionality.

“It is a high-density electronic fiber that’s also exceptionally biocompatible due to its softness,” Qian said. “It can stay inside the body for months at a time or longer, and it’s so soft and small that it can be implanted without discomfort or harm to the patient.”

Beyond the thin and soft circuitry, Bao’s

team also developed a clever roll-up fabrication technique. They prepared a [video of the method](#) that shows a prototype with 20 electronic channels laid out on a thin, transparent skin-like material. The film is then rolled tightly into a spindle so thin it is described as one-dimensional. All 20 electrical connecting wires in the example are spiraled inside the string, like the layers in a [Swiss roll](#), while the 20 sensors are exposed on the surface. Each independent sensor/stimulator is connected by a discrete wire running the length of the NeuroString to deliver valuable data.

Bao said the approach allows exquisite control of the positioning and distribution of the active components, and her team has demonstrated a fiber with a remarkable 1,280 individual channels. “Many more channels can be added if we make longer fibers,” says [Muhammad Khatib](#), a postdoctoral fellow and first author on the paper.

New frontiers

On a practical front, to demonstrate the effectiveness of their new electronic fiber, Bao, Dunn, and team used the implanted NeuroString to monitor the intestines of a pig and to observe individual neurons in the brain of a mouse over four months.

Dunn explained that, in his field, measuring basic things like how the intestine contracts without interrupting normal



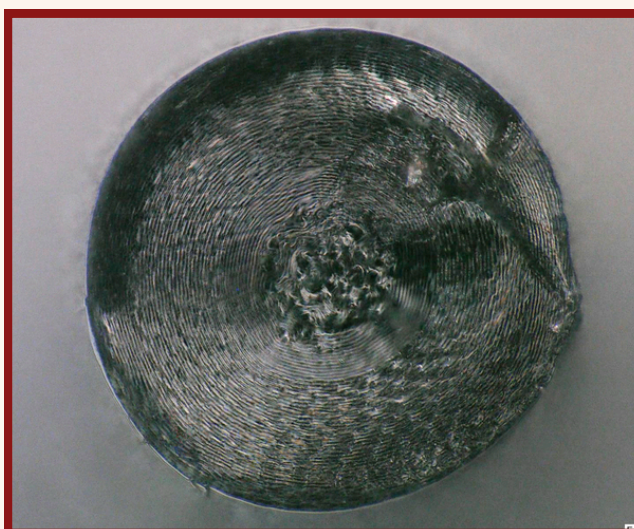
*Image credit:
Chengyi Xu*

activities may sound easy, but it has so far been out of reach, not to mention that the intestine also does a lot of things like absorbing nutrients and secreting biochemicals like serotonin that he might want to track. “To be able to stimulate the muscle and measure all these other things in a specific region will be transformative for my research and, potentially, my medical practice – NeuroString is a platform for us to understand how the intestine works,” Dunn said.

The research team anticipates that such devices could have far-reaching impacts in fields ranging from neuroscience to gastroenterology. They envision that it could yield robotic pills that can be swallowed to diagnose medical conditions throughout the gastrointestinal tract or be wrapped around an optical fiber to create an ultra-thin endoscope.

Qian thinks NeuroString could introduce an era of minimally invasive, closed-loop neural stimulation techniques – devices that can both sense nerve dysfunction and intervene in an instant. “You only need to stimulate when you detect this abnormal electric signal to shut it down,” Qian said of his device, which he is currently testing in mice. “It will be ten times smaller than conventional alternatives and much safer with fewer complications. It would be groundbreaking.”

A cross-section of the NeuroString. Multiple electrical channels can be spiraled inside the string, like the layers in a Swiss roll. It's rolled so tightly that the string can be described as one-dimensional. | Courtesy Bao Lab



In a tubelike form, Bao says the NeuroString could deliver drugs to precise locations inside the body. Imagine a new form of implantable insulin pump that both senses blood sugar and delivers the life-sustaining hormone on demand, much like the pancreas.

In brain studies, NeuroString could deliver light for optogenetics and sense its effect on local neurons to optimize light intensity. And these potential applications are only the in-body opportunities for NeuroString. In other practical outlets, Bao said, NeuroString might lead to a new era of smart fabrics and textiles, wearable devices, and soft robotics.

Synthetic organs

One area of research that Bao finds particularly intriguing is organoids – lab-grown tissues that function like real tissue for use in research. Her team, together with [Xiaoke Chen](#), associate professor of biology in the [School of Humanities and Sciences](#), initially developed a NeuroString with only one neurochemical sensor seeded by [Bio-X seed funding](#). The team's initial development of this advanced NeuroString came under the aegis of the [Brain Organogenesis Big Ideas in Neuroscience program at the Wu Tsai Neurosciences Institute](#).

The Brain Organogenesis program is

pursuing new models of human brain circuits to understand how the brain develops and what is happening when things go wrong, as in numerous neurological and psychiatric diseases from depression to Parkinson's disease. Bao said her NeuroString technology was inspired by the need for soft sensors that can be embedded inside the growing organoids that will allow researchers deeper insights into the function and biochemistry of these lab grown mini-organlike structures to mimic human tissues.

“We hope to thread these thin electronics inside and throughout organoids, to promote and monitor their growth,” Bao said. “That’s our vision and it’s pretty exciting.”

View article in the [Stanford Report](#).

Reference

M. Khatib, E.T. Zhao, S. Wei, J. Park, A. Abramson, E. Spear Bishop, A.L. Thomas, C.H. Chen, P. Emengo, C. Xu, R. Hammett, S.E. Root, L. Yuan, M.J. Wurdack, T. Zaluska, Y. Lee, K. Parkatzidis, W. Yu, D. Chakhtoura, K.K. Kim, D. Zhong, Y. Nishio, C. Zhao, C. Wu, Y. Jiang, A. Zhang, J. Li, W. Wang, F. Salimi-Jazi, T.A. Rafeeqi, N.M. Hemed, J.B.H. Tok, X. Qian, X. Chen, J.A. Kaltschmidt, J.C.Y. Dunn, Z. Bao, "[High-density soft bioelectronic fibers for multimodal sensing and stimulation](#)", *Nature*, 645, 656-664, 2025.



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The Map to Pain-Free Injectables and Precision Medicine

By Jerry (Yuhsiang) Cheng,
PhD Student

What if you never needed to get a shot ever again? In a [new study](#) published in *Advanced Materials*, Dr. Netra Unni Rajesh and colleagues from the [DeSimone Lab](#) at Stanford U. have reimagined the humble microneedle array patch – tiny skin-perforating devices that have long promised to make needle-based medicine more accessible and less painful – by harnessing the transformative power of advanced 3D printing. This work isn't about turning these patches into long-term wearables; it's about creating single-use, high-precision delivery devices that expand what's possible in the clinic and beyond.

Traditional microneedle patches have been constrained by the rigid shapes and fragile materials of earlier generations. Silicon-based arrays, labor-intensive photolithography, and the challenge of scaling these devices for real-world use have held back widespread adoption. At a [TED Talk in 2015](#), Prof. DeSimone joked, “3D printing is actually a misnomer; it's actually 2D printing over and over again... There are mushrooms that grow faster than 3D printed parts.” Rather than printing layer by layer, the DeSimone Lab developed continuous liquid interface production (CLIP) ([Tumbleston et al., 2015](#)), which leverages light and oxygen to grow parts continuously. Prof. DeSimone founded [Carbon](#) to scale CLIP manufacturing capabilities, and this technology has already been used to precision-engineer everything from sports equipment to dental devices.

An array of lattice designs

The team at Stanford used CLIP to craft a library of 3D-printed lattice microneedle array patches (L-MAPs) that incorporate hollow cells within each needle structure, a design previously impossible with traditional printing methods. These lattice

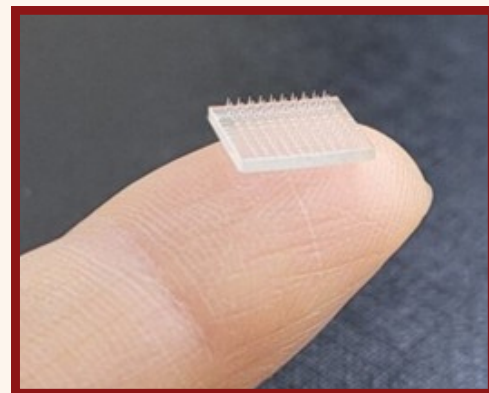
voids aren't just structural quirks; they create an unprecedented ability to load both solid and liquid cargo onto a single patch – making it possible, for instance, to co-deliver a thermostable solid antigen with a liquid mRNA-based adjuvant. Beyond rethinking how needles are shaped, this approach redefines what a delivery device can be. Traditional patches relied on uniform, solid projections that could only carry a small amount of one type of drug. In contrast, these new latticed designs allow for precise spatial patterning of multiple cargo types, essentially transforming each patch into a modular micro-factory. It's a concept that collapses the boundary between drug and device, and hints at a future where a single patch could contain different drug types for simultaneous or staggered release, tailored to complex treatment regimens.

The DeSimone team didn't just design these lattices; they rigorously validated them. Mechanical testing confirmed that the L-MAPs buckle safely – rather than fracturing – under pressure, minimizing the risk of fragments being left behind in the skin. In skin models, these lattices delivered twice the cargo of conventional patches, including proteins and lipid nanoparticle-encapsulated mRNA – the very tools that have driven the latest waves of vaccine development.

Preparing for the medical market

And while Carbon already produces a broad range of products, [the announcement about PinPrint](#) is hot off the presses as a spinout poised to translate these microneedle breakthroughs directly into therapeutic applications. PinPrint's mission isn't just about proving that these patches work in a lab – it's about turning them into viable clinical products, from self-administered vaccines to treatments for hard-to-reach disease targets. These “hard-to-reach” diseases are not only difficult to treat due to anatomy but also

have challenges from biochemistry. Many emerging therapies require delivery to immuno-privileged tissues or depend on delicate molecules that degrade quickly in circulation. Delivering these through a transdermal route – without needing refrigeration, injection equipment, or trained personnel – could rewrite access equations for conditions like HPV, HIV, and even neurodegenerative diseases via peripheral biomarkers.



*Microneedle array patch Image Credit:
DeSimone Lab, Stanford U.*

The engineering complexity behind these lattices also offers another advantage: the ability to create patches with multiple needle designs on a single patch. In their work, the team developed hybrid patches that integrate different needle geometries within one device, allowing them to deliver drugs with distinct release profiles simultaneously. This kind of multiplexed delivery system has the potential to revolutionize how we think about combination therapies or drug cocktails – no more separate injections or staggered pills, but a single patch with a choreography of precise micro-deliveries.

The translational challenge is clear: how do we scale these devices beyond research use, ensuring safety, regulatory compliance, and economic feasibility? But with PinPrint's focus on therapeutic applications and Carbon's already-proven manufacturing infrastructure – this vision

is closer to clinical reality than ever.

Precision plus adaptability

Equally striking is how these single-use microneedle arrays address a persistent challenge in transdermal drug delivery: the mismatch between the body's protective skin layers and the need to deliver large or delicate therapeutic molecules. The skin's outer layer, the stratum corneum, is less than 20 microns thick, but it's a formidable barrier to most drugs. By puncturing just past this layer, without hitting pain receptors or blood vessels, L-MAPs navigate this barrier with minimal discomfort and maximum precision.

This kind of precision requires both mechanical performance and robustness. By ensuring that needles buckle rather than snap, the team minimized the risk of inflammation or infection from residual fragments – an essential safety consideration. In the broader context of patient acceptance, these features could mean the difference between adoption and rejection of this technology in real-world settings.

Importantly, this precision is coupled with adaptability. The researchers used in-silico

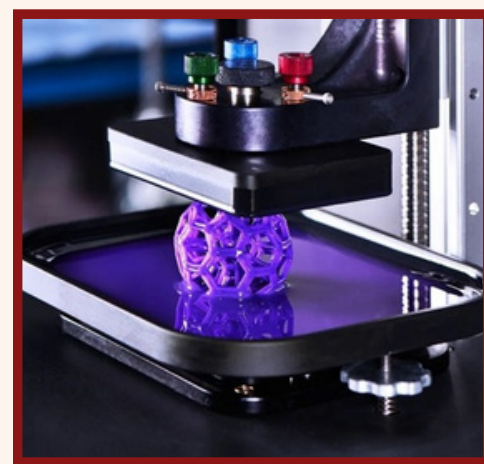
modeling to tweak every variable: the width of each needle's strut, the angle of tapering, and the spacing of the lattice cells. This means that each patch can be tailored for different therapeutic applications, from rapid-release vaccines to slow-release cancer immunotherapies. Such design freedom is almost impossible to achieve with older photolithography-based or mold-cast microneedles.

Co-design of delivery and medication

What makes CLIP so uniquely suited to this task isn't just its speed – it's the ability to print gradients and curvature with microscopic resolution. Imagine a future where every patient receives a patch printed specifically for their physiology, their medication, and their lifestyle. The shift from mass-manufactured medicine to individualized pharmacotherapy may be powered not by a new molecule, but by a new manufacturing paradigm.

This work exemplifies a broader shift in bioelectronics: rethinking both the materials we use and the architectures we build to interface with the human body. If find ourselves designing drug-device symphonies rather than single-target interventions.

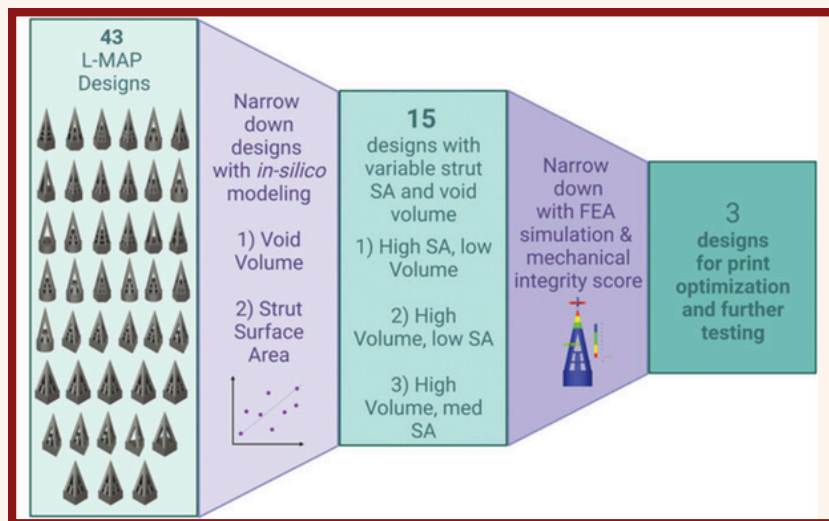
The human implications are profound. For the 20th century of medicine was about synthesizing new molecules, the 21st may be about co-development of medicine and smarter, more adaptable ways to deliver



A continuous liquid interface production (CLIP) 3D printer in action. Image Credit: Spencer Lowell.

them. In doing so, the lines between molecular design and biological function begin to blur. A patch is no longer just a delivery tool – it's a digitally fabricated interface with the body's own networks. As additive manufacturing increasingly intersects with synthetic biology, we may patients with needle phobia, these microneedle patches offer a near-painless alternative. For populations in low-resource settings, they promise easier distribution of critical vaccines and medications without reliance on cold-chain infrastructure or highly trained staff. And for chronic conditions – like diabetes, autoimmune diseases, or even some cancers – they could provide more consistent and less invasive treatment over time.

The business implications are no less significant. PinPrint's emergence as a dedicated therapeutics company, distinct from Carbon's manufacturing focus,



Schematic of the L-MAP design pipeline. Image Credit: Netra Rajesh, Stanford U.

signals an understanding that technological innovation alone isn't enough. It's the integration of engineering with clinical insight, regulatory strategy, health system readiness, and patient acceptance that will ultimately decide whether these patches make it to market.

A template for future therapies

An intriguing idea is that lattice microneedles might eventually be adapted for real-time sensing. Imagine a single-use patch that not only delivers medication but also monitors biomarkers in the skin's interstitial fluid, feeding data back to a physician or an AI-powered diagnostic system. This kind of closed-loop system – therapeutic and diagnostic in one – could one day redefine what it means to be “connected” to your own health.

Looking forward, the challenge may not be technological at all – but cultural. How do we retrain clinicians, rethink supply chains, and reframe patient expectations around this new category of therapeutics? As with any platform shift, the real disruption will be felt in the systems built around it.

What started as a sci-fi dream, an origin story Prof. DeSimone shared during his TED talk, has slowly morphed into reality. This story is about more than microneedles. It's a window into how engineering can reshape the future of medicine. As researchers and clinicians grapple with the challenges of delivering fragile molecules to precise cellular targets, this approach – relying on modular, highly adaptable devices – may offer a template for future therapies.

Yet even as we look to the future, it's clear that the present is already changing. The DeSimone Lab's work challenges us to think beyond the patch itself: to consider how manufacturing, materials, and

medicine can converge to create more humane, patient-centered tools. If successful, this vision could help close the gap between the promise of precision medicine and the realities of global health delivery.

*The **eWEAR-TCCI awards for science writing** is a project commissioned by the **Wearable Electronics Initiative** (eWEAR) at Stanford University and made possible by funding through eWEAR industrial affiliates program member Shanda Group and the **Tianqiao and Chrissy Chen Institute** (TCCI®).*



Jerry (Yuhsiang) Cheng is a PhD candidate in the Neurosciences PhD program at Stanford. He works in the Gibson Lab, studying how glial cells maintain brain homeostasis and how peripheral infections chronically disrupt the central nervous system. In college, he developed a regulatable dual AAV vector system to treat Alzheimer's disease. Before graduate school, he also worked on blood-brain barrier-crossing therapies at Denali Therapeutics. Jerry is most excited for opportunities to help shape the world through emerging intersections at the frontiers of biology and technology.



Lead author Netra Unni Rajesh, now at McKinsey & Company. Image Credit: Girlstart.



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Professor Joseph DeSimone, Stanford U.

Artificial Intelligence Unlocks New Insights from Wearable Data

By Chibuike K. Uwakwe,
MD-PhD Student

Wearables, such as smart watches and smart rings, are typically equipped with a range of sensors that provide information intended to boost users' understanding of their current physical health, enabling them to maximize their "healthspan" – that is, increasing longevity with good health. Wearables continuously track data, such as heart rate, physical activity, and blood oxygen saturation, which are important metrics for monitoring and maintaining health.

Health risks related to diabetes can significantly reduce healthspan. Continuous glucose monitors (CGMs), another type of wearable, have introduced opportunities to monitor health related to diabetes risk. One reason the commercialization of CGMs has been so impactful is the high prevalence of diabetes and prediabetes in the world. The Centers for Disease Control and Prevention reports that 38.4 million people in the United States have diabetes and another 97.6 million people have prediabetes [1]. The International Diabetes Federation estimates that 589 million people have diabetes worldwide [2].

CGMs enable users with diabetes or prediabetes to track their blood sugar levels in real-time and keep them within a target range. This often involves reacting to spikes and drops in blood sugar levels that may occur throughout the day. The management of blood sugar also plays a role in regulating weight, cholesterol, inflammation, and other aspects of health.

Glucose Responses to Food Vary across Individuals

In January 2017 the [Synder Lab](#) at Stanford University School of Medicine first shared their research on exploring the utility of tracking physiomes and activity using

wearable biosensors in gathering health-related information [3]. The group, led by Professor Michael Snyder, the Stanford W. Ascherman Professor of Genetics at Stanford University, found that they could distinguish between insulin-sensitive and insulin-resistant individuals using wearable sensor data, which suggested that wearable sensors could be used to detect risk for type 2 diabetes.

Prof. Snyder and his group at Stanford U. continued their research using CGMs to measure glucose levels in people with type 2 diabetes, prediabetics, and "healthy" people. The Snyder Lab observed that "different people spike to different foods," whether that be pasta, potatoes, or bread, in a highly personalized manner. This observation sparked the idea of building personalized models of blood sugar response.

Encouraged by the research findings, Prof. Snyder co-founded the company [January AI](#). Ideally, one would be able to anticipate these fluctuations in advance using artificial intelligence.

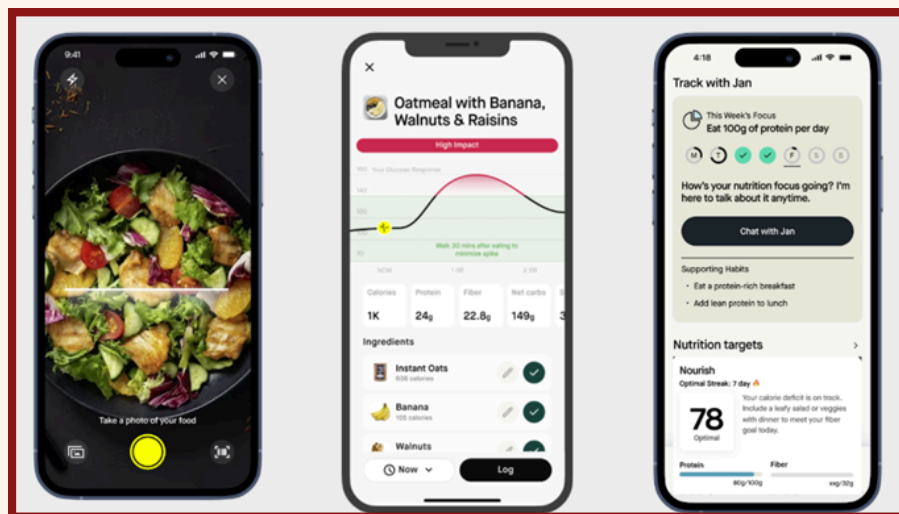
A Digital Twin to Predict Glucose

The team at January AI developed their own generative AI to predict a person's blood sugar levels. With wearable



Professor Michael Snyder

platforms generating a large volume of data, machine learning has emerged as a powerful means of processing and interpreting it. January AI's machine learning models are built upon millions of data points comprising wearable, demographic and user-reported data. In their app, demographic information – including height, weight, age, sex, and health state – can be combined with January AI's predictive algorithm trained on thousands of users' real CGM data to create a "digital twin" for precise predictions of blood sugar levels in response to food ingredients. This is based on a food's glycemic index, a measure of how quickly and how much a food will raise your blood glucose, and the user's health state (i.e., healthy, prediabetes, or type 2 diabetes).



January AI app overview; image credit: January AI

January AI pairs these predictions with an on-demand AI nutritionist, delivering personalized guidance that evolves with users' goals, habits, and metabolism. The app enables users to log food easily and accurately with a quick photo, or by describing what they ate in a simple sentence. To be specific, January AI utilizes AI-powered food recognition, allowing users to snap a picture of their meal to instantly analyze its nutritional content and predict glucose impact before they eat. This feature shifts nutrition tracking from passive logging to proactive metabolic optimization.

January AI's breakthrough technology was not developed in one night. "We've spent nearly a decade building January AI so people can see how food affects their blood sugar before they eat it," said Noosheen Hashemi, Founder and CEO of January AI. "Our goal isn't to make health complicated; it's to give people the clarity and confidence to make better choices in real time, without invasive devices."

AI-enhanced Tools for Behavior Change

Beyond theoretical impacts on user health, there is evidence that AI-enhanced digital health interventions like the January AI app are beneficial. In a study published in *npj Digital Medicine*, the January AI team found that their app can improve glycemic control and promote weight loss, particularly when users are actively engaged [4].

Hashemi discussed the company's evidence-based impact saying, "Our research shows that when people are given the right tools — personalized, predictive, and rooted in science — they start changing behavior. That's what January delivers."

To Prof. Snyder, these findings are promising because "health coaches don't scale very well. You can't get millions and millions of people to have health coaches."



Noosheen Hashemi, Founder & CEO,
January AI

In contrast, the January AI app can solve this scalability issue and help address one of the leading problems impacting healthspan. "The diabetes endemic is more pervasive than the COVID pandemic," said Prof. Snyder.

Further Health Insights Using AI with Data from Wearables

The January AI app goes beyond just blood sugar management to improve overall metabolic health. The app focuses on setting weekly nutrition targets, based on the user's health goals, via its AI nutritionist, and ingests sleep and activity data from Apple Health Kit. January AI released a feature that enables users to upload results from recent blood tests to offer more personalized nutritional recommendations and insights, and the team has plans to bring in other kinds of data (such as genomics and microbiome data, etc.) to make its recommendations even more personalized in the near future.

January AI's use of artificial intelligence to gain new insights from continuous glucose monitoring devices is just one example of how AI can be leveraged to transform wearable data analysis. AI has been used to power the next generation of electronic skin via early disease detection and infectious disease tracing and monitoring [5]. AI agents like *Biomni* have been shown to perform wearable bioinformatics analyses up to 800 times faster than

human experts, presenting a promising solution to managing the mountain of data generated by wearable devices [6]. Another example is the combination of multiple wearable platforms powered by AI, which could create "intelligent healthcare environments" that coordinate to optimize patient safety [7].

With that said, as we embrace the ubiquitous use of AI to unlock insights from wearable data and promote human health, it is important to forefront key issues such as built-in biases and data privacy. By acknowledging the limitations and challenges associated with the use of AI, we can work toward developing more equitable, transparent, and secure wearables that truly improve health outcomes and healthspan for all.

The eWEAR-TCCI awards for science writing is a project commissioned by the Wearable Electronics Initiative (eWEAR) at Stanford University and made possible by funding through eWEAR industrial affiliates program member Shanda Group and the Tianqiao and Chrissy Chen Institute (TCCI®).



Chibuike "Chibby" Uwakwe is an MD-PhD student in the School of Medicine at Stanford University whose research focuses on developing wearable bioelectronics for continuous biological monitoring and personalized medicine. Originally from Wilson, North Carolina, Chibuike graduated from Harvard University in 2023 with an AB in Biomedical Engineering.



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Celebration Symposium

March 3, 2025



The Tianqiao and Chrissy Chen Ideation and Prototyping Lab (Chen IPL) was inaugurated on March 3, 2025 with a Celebration Symposium and ribbon cutting ceremony. We were honored to have Chrissy give opening remarks, along with eWEAR-X faculty directors, Prof. Zhenan Bao and Prof. Xiang Qian. Faculty keynote presentations were on topics related to focus areas of the Chen IPL. Prof. Michael Snyder spoke about the importance of omics data for precision health, Prof. Oussama Khatib described robotics research

projects, and Prof. Jaimie Henderson presented about achievements in brain-computer interfaces. Dean Jennifer Widom of the School of Engineering, Andrew Spakowitz, Chair of the Chemical Engineering Department, and Mark Horowitz, Chair of the Electrical Engineering, expressed their gratitude to Tianqiao and Chrissy. Chrissy Luo and Zhenan Bao cut the ribbon together for the lab naming ceremony, with participation from Dean Widom, Xiang Qian, Andrew Spakowitz, Mark Horowitz, and others.

Agenda

Opening Remarks

Professor **Zhenan Bao**, Professor **Xiang Qian**, & **Chrissy Luo**

“Transforming Healthcare Using Wearables and Remote Monitoring”

Professor **Michael Snyder**

Overview of Projects in the Stanford Robotics Center

Professor **Oussama Khatib**

“Recent Advances in Intracortical Brain-Computer Interfaces”

Professor **Jaimie Henderson**, M.D.

Special Remarks

Jennifer Widom, Dean of the School of Engineering, Professor **Andrew Spakowitz**, Chair of Chemical Engineering, and Professor **Mark Horowitz**, Chair of Electrical Engineering

Ribbon Cutting Ceremony



Chen IPL Mission

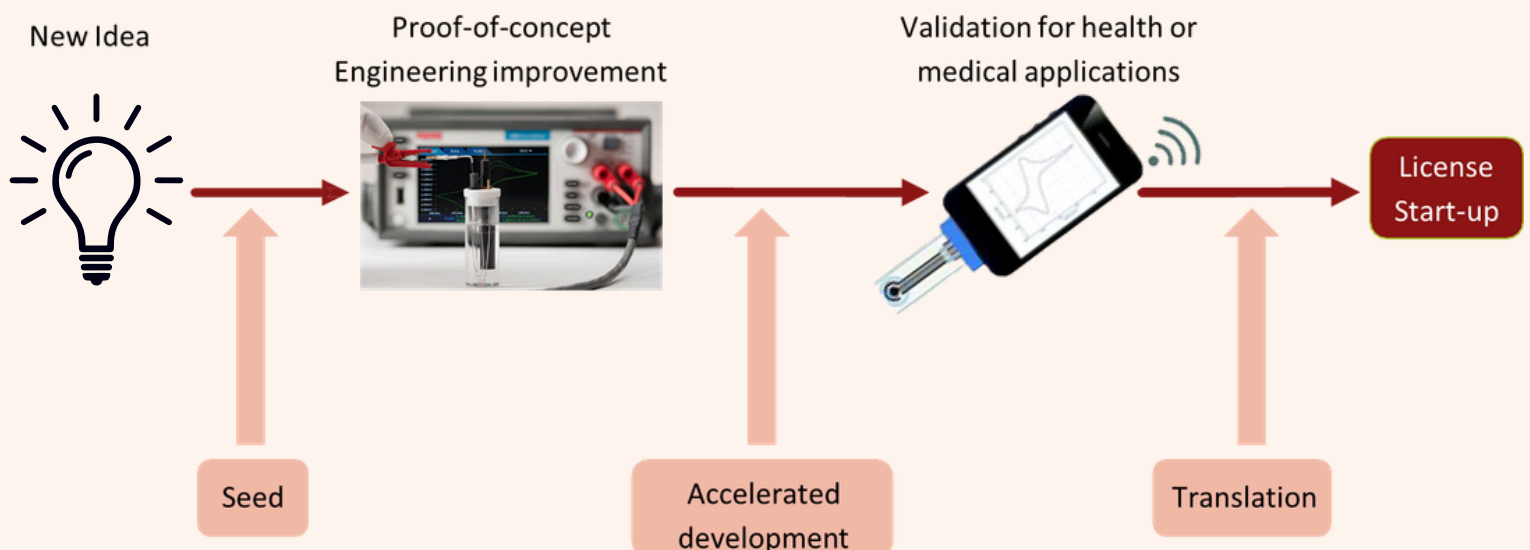
Chen IPL

The Tianqiao and Chrissy Chen Ideation and Prototyping Laboratory (Chen IPL) is where researchers can access and share expertise, that nurtures innovation and learning, to build efficient, specialized electronics systems.

The Chen IPL Mission is to enable the design of prototype devices and translation discoveries to catalyze breakthroughs in Embodied AI. Scope of prototypes includes flagship areas of human health sensing, human machine interface, and robotics.

- Accelerate lab-to-real-world deployment and foster innovation.
- Facilitate prototype system design and implementation.
- Validate devices from lab to relevant settings and applications.
- Train students with system-level thinking.
- Emphasize interdisciplinary collaboration.

There is a great need to accelerate the process
from **science** project to **prototype** to useful Embodied AI **applications**



Chen IPL Overview



The Chen IPL in the Stanford Nanofabrication Facility is enhancing its capabilities to support Embodied AI innovations. This dedicated space on Stanford campus has been made possible through a generous donation by the Tianqiao and Chrissy Chen Institute. The support enables Stanford University to build a community around medical device prototyping through interactions that share multi-disciplinary expertise. The lab will provide engineering assistance and a workspace for collaboration on biosensors, robotics, wearables, and medical devices.

The prototyping lab can accelerate the later stages of translational research, from lab projects to viable prototypes. Projects at the lab will lead to novel solutions for health enabled by engineering that combines deep tech, AI, and data science. The prototyping lab will bring new opportunities for faculty and students across Stanford University to benefit from the strength of a top engineering school.

“The Stanford Nanofabrication Facility has long been a leading space for interdisciplinary collaboration and innovation. This generous donation enables us to expand the capabilities of the current prototyping facility to foster innovation specifically for medical technology, within and beyond Stanford,” said Jennifer Widom, the Frederick Emmons Terman Dean of the Stanford School of Engineering. “We’re grateful to the donor for making this important expansion possible, and excited to see the space take shape.”



Jennifer Widom, Dean of the School of Engineering

Support will contribute to salaries for expert staff, seed funding for prototyping facility usage, and acquisition of relevant equipment. Stanford faculty, students, and research scientists will receive experienced technical assistance on design, access to tools and equipment, and workspace for device design and form-factor development.



The Tianqiao and Chrissy Chen Ideation and Prototyping Laboratory (Chen IPL) enables the design of prototype devices and translation discoveries to catalyze breakthroughs in **Embodied AI**. As a shared facility in the Stanford Nanofabrication Facility, Chen IPL provides engineering assistance for innovation related to **health sensing, human-machine interfaces, and robotics**. Faculty and students share and access expertise at Stanford in engineering, medicine, and data science to build specialized electronic systems. The Chen IPL aims to accelerate lab-to-real-world deployment of innovation by facilitating the design and creation of prototypes, instilling system-level thinking, and validating devices for relevant applications.

6

Manuscripts
published

3

Flagship projects
funded

7

Seed projects
funded

Celebrating the opening of the Chen IPL

The Chen IPL was inaugurated in 2025 with a ribbon cutting ceremony and symposium. Seed project grants were awarded to seven research teams for use in the Chen IPL for circuit board design and prototyping.

The Chen IPL provides engineering design and prototyping assistance to accelerate applications of Embodied AI.

Human Health Sensing Systems

“Soft bioelectronic fiber can track hundreds of biological events simultaneously”

Human Machine Interface

“GenENet: Generative Electromyography Network”

Robotics

“DexSkin: A step toward human sense of touch for robots”

“GentleHumanoid framework for safe and compliant robot-human interactions”

Seed Projects

- *Ultraminiaturized Wireless Systems for Multi-dose Drug Delivery*
- *AirAware: A Wearable System for Environmental Exposure Monitoring*
- *A Wearable EOG Signal Conditioning Platform for Real-Time Vertigo Assessment*
- *Wireless Wearable Device for the Measurement of Human Breast Lactation*
- *Tracheal Monitoring to Detect Presence and Quality of Respiratory Airflow*
- *Wearable Electronics Prototyping for Gastric Health Monitoring*
- *LacTrax: A wearable sensor for continuous interstitial lactate measurement*

GenENet: Generative Electromyography Network

Motions we intend to make with our hands, arms, and legs can be predicted using non-invasive sensor arrays on the skin in combination with artificial intelligence. Electrical activity generated by muscles during contraction, which reflects underlying neural activation, can be detected during movement through a technique known as electromyography (EMG). Recent advances in EMG devices, together with machine learning frameworks, are enabling new forms of human-machine interfaces (HMI) that can decode rich motor intent from wearable systems. Such HMI technology has many potential applications, for example, assistive devices, prosthetics, remote control of robots, interpreting hand gestures, telesurgery, improving athletic performance, and health monitoring.



Bao Group, Stanford U.

A key challenge for existing EMG systems has been the need for high-resolution sensing over large areas of the body, which typically requires cumbersome, high-channel-count sensor arrays placed on the skin. As a result, an inherent trade-off has existed between designing comfortable, wearable sensors and acquiring rich, spatially resolved EMG data from large numbers of channels. The research groups of Prof. Zhenan Bao and Prof. Scott Delp at Stanford U. collaborated to address this challenge and developed a generative electromyography network (GenENet).

In a [report](#) in Nature Sensors, the research teams described and demonstrated the GenENet innovation, a self-supervised generative representation learning

framework combined with a wearable sensor that maps limited sensor inputs into a learned muscle representation space, enabling reconstruction of muscle activity patterns beyond the directly sensed regions. Their approach allows for gathering information equivalent to those from high-density EMG sensor networks, but using a more compact, wearable device with much reduced sensor counts, without sacrificing performance. The team tested GenENet for two uses – predicting alphabet letters in sign language and evaluating gait dynamics. They trained a 6-channel EMG device using a 32-channel dataset and demonstrated that the 6-channel device performed with similar accuracy to a 32-channel device. These evaluations highlight the utility of the GenENet concept to reduce wearable-sensing-system complexity while maintaining prediction quality.

The GenENet approach enables the use of compact and low-power-consumption few-electrode arrays to predict signals equivalent to those from a much larger-area and high-electrode count system. Precise prediction of gestures and gait dynamics previously required increasing footprint and body coverage, such as large EMG grids with 64 to 256 electrodes, or relied on fewer electrodes combined with external sensors or distributed attachments. Kyun Kyu (Richard) Kim, PhD, lead author on the report, described the benefits, “By leveraging learned muscle representations, the approach breaks the traditional trade-off between sensing resolution and wearability, reducing sensor count and data-transmission power while preserving predictive performance.”

In the pre-training phase, the representation learning network was trained on a high-quality, multichannel dataset obtained from low-impedance polymer electrodes and higher-signal-to-noise ratio stretchable interconnections. The method directly leverages the generalized representations learned through masked generative pre-training.

This network was then integrated with a lightweight long short-term memory (LSTM) layer to enable sequential processing for sequential modeling of kinetic inputs.

The successful demonstration of a compact six-channel EMG device for complex task predictions, such as individual alphabet recognition and gait dynamics predictions, highlights potential, practical applications. The researchers anticipate that this platform could be extended to accommodate additional types of input that typically require high-density sensory arrays and have correlations between the signals. Potential uses are for wearable medical devices that include photodiodes, ultrasonic sensors, or chemical sensors; for health monitoring of muscle strain or skin temperature; and for medical electrophysiological sensing in electrocardiograms or electroencephalograms.



Kyun Kyu (Richard) Kim

Reference

K.K. Kim, T.J. Zaluska, S. Skov, Y. Lee, H. Park, D. Zhong, M. Khatib, Y. Nishio, Y. Jiang, S.L. Delp, Z. Bao, "[A simplified wearable device powered by a generative EMG network for hand-gesture recognition and gait prediction](#)", Nat. Sens. 1, 27-38, 2025.



Scan for article

DexSkin: A Step Toward Human Sense of Touch for Robots

Human skin provides rich, tactile sensing over contoured surfaces on the hand. Our sense of touch is essential for fine dexterity to grasp and manipulate objects. Information about the shape, surface texture, and composition of objects also can be learned through touch. For future robots to have dexterity like human hands, they need grippers that provide continuous, rich streams of tactile data for Embodied AI, so they can determine the characteristics of an object, and manipulate it in complex ways without damaging or dropping.

Providing robotic systems with a sense of touch and the ability to interpret and respond to tactile input remains a challenge. An approach is to create a sensing system that has capabilities of human touch and that, like a person, learns and decides what to do using tactile information. The research groups of Prof. Zhenan Bao and Prof. Jiajun Wu of Stanford U. are working toward this goal with their development of DexSkin. DexSkin is a soft, conformable capacitive electronic skin that enables sensitive, localized, and calibratable tactile sensing, and can be tailored to varying geometries over large and contoured surfaces. In a recent [report](#), the teams equip robotic gripper fingertips with DexSkin and evaluate DexSkin's capabilities in learning challenging manipulation tasks that require sensing coverage across the entire surface of the fingers.

The teams evaluated whether a two-fingered, robot gripper equipped with DexSkin could learn and perform two kinds of tasks: 1) Pen reorientation - The robot must pick up the pen and push it against a flat face of a nearby cabinet to reorient it in-hand for writing. 2) Packaging - The robot must check that the elastic band is suitable and then wrap the band around a box to secure the lid. The performance of a robot with full DexSkin sensor coverage was compared to its performance using no tactile feedback, commercially available sensors, or DexSkin information from only

the inner sides of the fingers - with surprising results.



Bao Group, Stanford U.

Pen reorientation

To re-orient the pen, the robot uses the cabinet to push the pen from horizontal to vertical in its fingers. This task required the robot to use tactile information to estimate the in-hand pose of the pen. If the pen manipulation was successful, then a team member would push the end of the pen, so it was horizontal again in the robot's grasp. For the first part of the task, the robot performed well with both DexSkin and the commercial DIGIT sensors. However, for pens that the teammate had pushed back to horizontal, the robot with full DexSkin input learned the only policy that enabled the robot to return the pen to a vertical orientation reliably. An explanation is that the commercially available sensors did not cover a wide enough area on the gripper, whereas DexSkin coverage was complete. The sensor data given by conformal coverage of DexSkin enabled the embodied AI in the robot system to return the pen to a vertical pose if bumped.

Packaging with an elastic band

Humans use the dorsal (back) side of their fingertips to perform everyday tasks like flipping switches or removing batteries from TV remotes. To evaluate similar capabilities, the robot was tasked with wrapping an elastic band over a lid and its container. The robot was randomly provided with an intact band or a perforated band that could break if used. Discarding a band that is not in good

condition is challenging because the robot must adjust its behavior based on the tension the unknown band generates on the dorsal sides of the fingers.

Beyond allowing the policy to discern the suitability of a given elastic band, access to full DexSkin information improves the robot's ability to dynamically wrap the band around the box. This can be seen in the fraction of attempts that succeed in the band selection stage but fail in completing the packaging task of wrapping the band. For completing the second stage given success in the first stage, only 32% of tries for the "no tactile" input and 70% of attempts using only data from inside surfaces of DexSkin succeeded. Using sensor input from full DexSkin coverage allowed the robotic system to learn a policy that successfully completed the secondary wrapping task 86% of the time.

High-coverage conformable robotic skin for learning contact-rich manipulation

DexSkin is a hardware-software framework for embodied intelligence in contact-rich robotic manipulation with tactile sensing that approaches the coverage and sensitivity of human skin, while remaining practical for robots. Built from a soft, conformable capacitive "electronic skin," DexSkin provides high-coverage, localized touch sensing across curved gripper surfaces and can support imitation learning of human demonstrations, allow learned model transfer for different hardware grippers, and provide feedback for real-world online reinforcement learning.



Scan for
article

Reference

S.Wistreich, B.Shi, S.Tian, S.Clarke, M. Nath, C.Xu, Z.Bao, J.Wu, "[DexSkin: High-Coverage Conformable Robotic Skin for Learning Contact-Rich Manipulation](#)", Conference on Robot Learning (CoRL), 2025(Oral);arXiv,arXiv:2509.18830,2025.

GentleHumanoid Framework for Safe and Compliant Robot-Human Interactions

Humanoid robots in healthcare, resident care facilities, homes, or public spaces need to engage with people in ways that are safe. For robots that assist humans, the person being helped should be able to move as they normally would and have interactions that feel natural for them. For example, a robot may offer physical support to a person who has difficulty standing from sitting in a chair, it may carry various items for someone, or provide social support, like giving a hug or leading someone by the hand. To be successful, the humanoid robot must adjust its actions to fit the needs of the person it is helping. The robot should accommodate the shifting force that a person places on its arm as they stand up and the robot should adjust its embrace to fit the size and shape of someone asking for a hug.

Embodied AI is required for such decision making by the robot. The robot must modify its movements to complete tasks that have similar objectives, but require variation dependent on the person and the type of physical interactions. For these human-centered interactions, continuous sensing data is essential both to characterize the varying contact conditions and to quantify whether the robot behaves safely and compliantly during rollouts.

A challenge to achieving this adaptability for training robots is that many reinforcement learning policies emphasize rigid tracking and suppress external forces. Existing impedance-augmented approaches are typically restricted to stability of the robot and control of its effectors (arms, hands). The focus is on resisting extreme forces rather than enabling the robot to be compliant.

Teams at Stanford led by Prof. Karen Liu and Prof. Zhenan Bao are enabling better control of a robot's upper body under changing interaction forces. The researchers introduce "GentleHumanoid" as a framework that integrates impedance control into a whole-body motion tracking policy to achieve upper-body compliance. At its core is a unified spring-based formulation that models both resistive contacts (restoring forces when pressing against surfaces) and guiding contacts (pushes or pulls sampled from human motion data). This formulation ensures kinematically consistent forces across the shoulder, elbow, and wrist of the robot, while exposing the policy to diverse interaction scenarios. They further improve the safety of interacting with the robot through task-adjustable force thresholds.

The team evaluated their approach across various tasks in both simulation and on a humanoid robot. Their evaluations included tasks requiring different levels of compliance, including gentle hugging, sit-to-stand assistance, and safe object

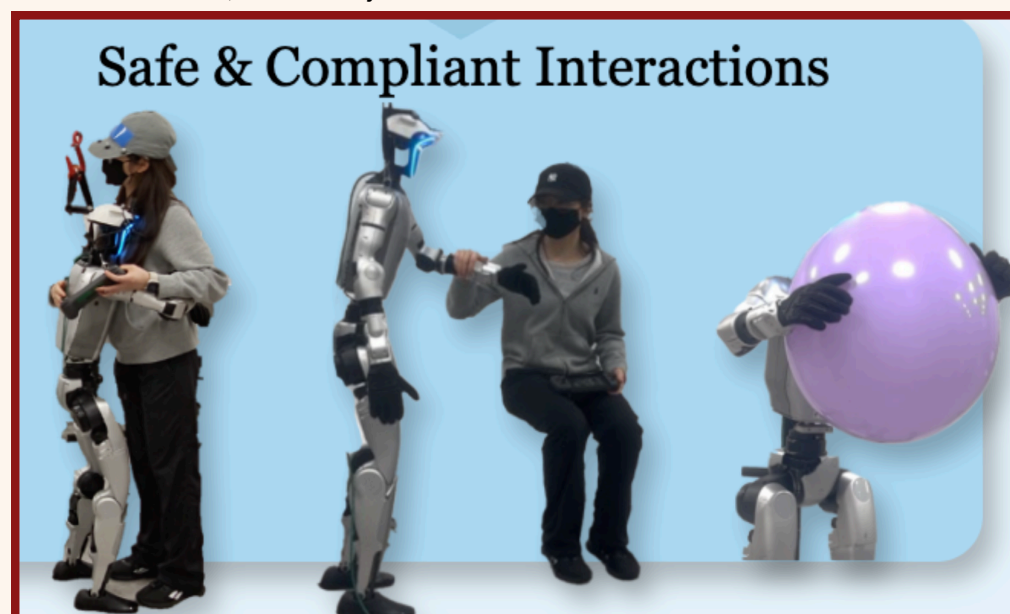
manipulation. Compared with baselines, the policy developed by the team consistently reduced peak contact forces while maintaining task success, resulting in smoother and more natural interactions. These results highlight a step toward humanoid robots that can safely and effectively collaborate with humans and handle objects in real-world environments.

Reference

Q. Lu, Y. Feng, B. Shi, M. Pisen, Z. Bao, C.K. Liu, "[GentleHumanoid: Learning Upper-body Compliance for Contact-rich Human and Object Interaction](#)", arXiv, arXiv:2511.04679, 2025.

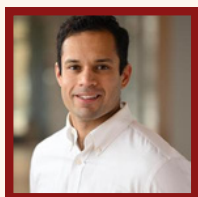


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GentleHumanoid Team, Stanford U.

Chen IPL Seed Grant Recipients



“Ultraminiaturized wireless systems for multi-dose drug delivery”

PI: Prof. Siddharth Krishnan

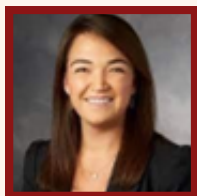
Students: Mitch Peterson, Sunghoon Rho, Huy Tran, Xiaoqin Wang



“AirAware: A wearable system for environmental exposure monitoring”

PI: Prof. Michael Snyder

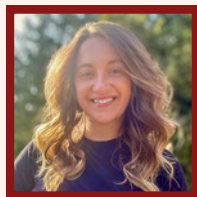
PostDoc: Allison Zhang



“A wearable EOG signal conditioning platform for real-time vertigo assessment”

PI: Prof. Kristen K. Steenerson

Students: Dan Fan, Steven Kargotich, Brad Liang, Mohit Singhala



“Wireless wearable device for the measurement of human breast lactation”

PI: Prof. Zerina Kapetanovic

Student: Jasmin Falconer, Baiyu Shi, Junyi Zhao



“Tracheal monitoring to detect presence and quality of respiratory airflow”

PI: Prof. Chris Chafe & Prof. Matthew Muffly

Student: Chris Relyea



“Wearable electronics prototyping for gastric health monitoring”

PI: Prof. Todd Coleman

Students: Leen Abdul Razzak, Syamantak Payra, Sophia Chengping Shen



“LacTrax: A wearable sensor for continuous interstitial lactate measurement”

PI: Prof. Brian Han | Lecturer: Dr. Ross Venook

Students: Caio Carcaioli Bonin, Julia Kao-Sowa, Jenny Nguyen, Quinn Ramberg

Stanford Engineering Centennial

The School of Engineering celebrated their 100th anniversary with a Centennial Celebration and Demo Showcase on May 15, 2025. Twelve Stanford research groups exhibited their projects in the Wearables Pavillion, organized by eWEAR-X. The Centennial Celebration attracted 3,000 attendees and created excitement for the future of wearable and implantable devices.

Achieving optical transparency in biological tissues with food colors | Prof. Guosong Hong

Beyond the screen: Immersive scientific explorations | Prof. Eric Darve

Circadian rhythms | Prof. Jamie Zeitzer

Concussion prediction and prevention using wearables | Prof. David Camarillo

e-Skin | Prof. Zhenan Bao

Haptiknit | Prof. Allison Okamura

Mixed Reality in medicine | Prof. Bruce Daniel

Neuromorphic chip | Prof. Alberto Salleo

Smart Belt: Path prediction wearable sensor | Prof. Monroe Kennedy

Wearable patches | Prof. Todd Coleman

3D Printed medical devices and composite tissues | Prof. Yunzhi Peter Yang

3D Printed microneedle array patches @ AMPF | Prof. Joseph DeSimone



Photos by Saul Bromberger

eWEAR Health Prize

October 30th- eWEAR Health Prize @ Stanford U. 2025

Opening Remarks

- ▶ **Angela McIntyre**, eWEAR Executive Director
- ▶ **Prof. Zhenan Bao**, eWEAR Faculty Director



Keynote & Fireside Chat

- ▶ **Sunita Mishra**, MBA, Former CMO Amazon Health Services
- ▶ Moderator: **Prof. Xiang Qian**, MD, eWEAR Co-Faculty Director



- ▶ **Pitch Competition**
8 Start-up companies
- ▶ **Panel Discussion & Awards**
- ▶ **Start-up Demo Showcase & Networking Reception**

Pitch Competition

Pitch Presenters



Axo Neurotech

Amy Rochford



Billion Labs Inc

Edward Wang



Care Collaborative

Ronald AngSiy



DizzyEX

Danyang Fan



Exposomics

Allison Zhang



MiiHealth AI

Jacob Lester



Model Health

Antoine Falisse



Perception Medicine

Yijiang Chen

Judges Panel

Anne DeGheest, Founder and Managing Director, *HealthTech Capital*

Mary T Jacobson, MD, Co-Founder, *Hello Alpha*; President, *Alpha Telemedicine*

Daniel Kraft, MD, Founder of *NextMed Health* and *Digital.Health*

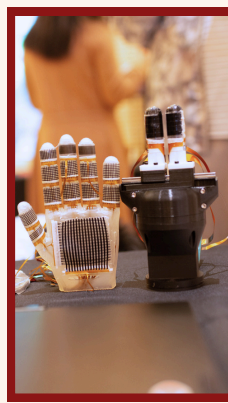
Barrett Larson, MD, Clinical Assistant Professor, Anesthesia, *Stanford University*

Monisha Perkash, Lecturer, Graduate School of Business, *Stanford University*



Demo Showcase

- ◆ **MiiHealth AI** | John Wall
- ◆ **Care Collaborative** | Flora Ma
- ◆ **Billion Labs Inc.** | Edward Wang
- ◆ **TheMedBubble** | Tiffani Johnson
- ◆ **Walnot Inc.** | Ali Rahimpour Jounghani
- ◆ **Model Health** | Antoine Falisse
- ◆ **LumosFit** | Hema Mandlekar
- ◆ **CuremAb Therapeutics Inc.** | Cristabelle De Souza
- ◆ **Superbio.ai** | Berke Buyukkucak
- ◆ **Tombot Inc.** | Tom Stevens
- ◆ **ContinuuMed** | Romal Mitr
- ◆ **Frontier Bio** | Eric Bennett
- ◆ **PyrAmes Inc.** | Xina Quan
- ◆ **iDental** | Iris Wedeking
- ◆ **e-Skin** | Bao Group



eWEAR Seminars

“AI insights from wearable sensors”

Tian Tan
Sneha Kadetotad (Meta Reality Labs)



“Material research for wearables and implantable devices”

Arielle Berman
Siddharth Doshi
Eunyoung (Grace) Kim
Julian Mele
Gerwin Dijk



“Materials, systems and spinoffs for robots and AI”

Benjamin C.K. Tee
(National University of Singapore)



“Monitoring health with wearables during sleep”

Lara Weed
Matthew Wiggins (Samsung Research)



“Wearable AI in clinical decisions”

Ben Viggiano & Krishna Pundi
Arjun Mahajan (Harvard Medical School) &
Dylan Powell (Nature npj Digital Medicine)



“Merging humans and machines: Innovation and translation”

Xuanhe Zhao (Massachusetts
Institute of Technology)



“Bioelectronics for drug delivery and biosensing”

Prof. Siddharth Krishnan



“Retinal neural interfaces”

Pingyu Wang
Mohajeet Bhuckory



“Neuroprosthetics”

Hugh Herr
(Massachusetts Institute of Technology)



Audience by Numbers

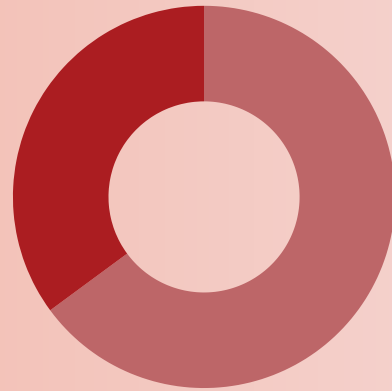
2,011

Total number of people that
attended eWEAR
Seminars & Symposia

Total number of
people attending In-
Person vs Online

In-Person
706

Online
1305



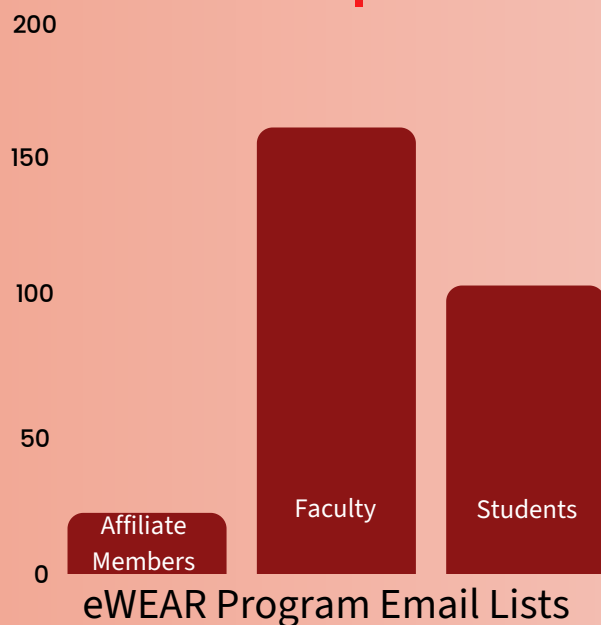
eWEAR Viewers Around the World



**50 Different countries viewed
eWEAR events**

eWEAR Reach

1,900+
Newsletter
Contacts



4,889 Followers
2,337 Page Views



115 User accounts on
eWEAR Website

Recordings viewed
139 times



Professors/Professionals Who Presented at Events



**Prof. Zhenan
Bao**



Mohajeet Bhuckory



**Prof. Jaimie
Henderson**



Hugh Herr



**Prof. Mark
Horowitz**



Sneha Kadetotad



**Prof. Oussama
Khatib**



**Prof. Siddharth
Krishnan**



Arjun Mahajan



Sunita Mishra



Dylan Powell



Krishna Pundi



Prof. Xiang Qian



**Prof. Michael
Snyder**



**Prof. Andrew
Spakowitz**



Benjamin C.K. Tee



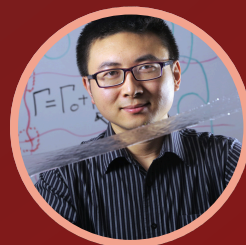
Ben Viggiano



**Dean Jennifer
Widom**



Matthew Wiggins



Xuanhe Zhao

eWEAR Affiliates Program

The Stanford Wearable Electronics (eWEAR) Initiative Industrial Affiliates Program enables forward looking corporations to engage with world-class researchers on pathfinding programs leading to new product opportunities.



- Bring together Stanford expertise in materials, electronics, systems, data, and medical science
- Push the forefront of wearable technologies
- Provide financial support for research related to wearables
- Discuss future applications and technology directions for wearables
- Foster collaborations among Stanford researchers and industry
- Networking opportunities between companies and with Stanford

Supporters

Benefactor



The Tianqiao and Chrissy Chen Institute is a global, multidisciplinary organization dedicated to advancing fundamental brain science, accelerating scientific discovery through artificial intelligence, and improving human well-being. Founded with the mission to understand how the brain perceives, learns, and interacts with the world, the Institute brings together leading researchers, physician scientists, engineers, and innovators across premier institutions worldwide. Through pioneering initiatives in neuroscience, AI-accelerated research, clinical translation and public science communication, the Chen Institute supports transformative ideas, empowers emerging talent, and builds collaborative ecosystems that push the boundaries of knowledge and human potential.

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Applied Materials, Inc., (Nasdaq: AMAT) is the leader in materials engineering solutions used to produce virtually every new chip and advanced display in the world. Our expertise in modifying materials at atomic levels and on an industrial scale enables customers to transform possibilities into reality. At Applied Materials, our innovations make possible™ the technology shaping the future.

Applied Materials is continuously looking for new application areas for our technology, where our ability to deposit, etch and structure thin films help other industries to solve problems and grow faster. We are very much interested in the areas of flexible electronics and bioengineering and open to explore collaborations and partnership to harden the technology for mass production.



BOE Technology AMERICA, Inc., founded in May 2012, is now becoming the vanguard troops of strategic customers development in North America, the forefront field of product and technology innovations, and the practice base of global expertise training, for entire BOE Group.

So far, BOE America has cultivated a cluster of strategic customers including the largest technology company in Silicon Valley, who enrolled BOE as a Chinese display supplier for the first time. At the same time, BOE America has provided better services to the existing customers for the win-win growth. In 2015, BOE America opened its first liaison office in Texas and in 2017 opened Boston and San Diego Office for organic expansion.

Mars Inc.



Ferryman Capital is a Singapore-based venture capital firm investing in early-stage technology companies shaping the future of AI, education, and digital innovation. The firm partners with ambitious founders at the earliest stages and supports them in building globally impactful companies.

The Ferryman team brings decades of venture capital and technology investment experience, with a strong track record of backing high-growth companies during the early stage. The team members were early investors in many well-known companies, including Gaotu Techedu (NYSE: GOTU) and Pop Mart (HK: 09992).

One of Ferryman's notable portfolio companies is AiEdu, an AI-powered EdTech startup that we backed at the angel stage and that has since grown into a unicorn. Ferryman continues to partner with visionary founders building the next generation of transformative technology companies.

Member Benefits

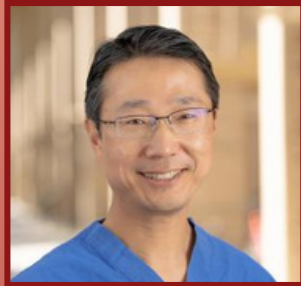
Member Benefits	Membership \$50,000/year
Name and logo on eWEAR website and acknowledgment at events	Included
Invitations to eWEAR symposia	Included
Facilitated access to eWEAR presentations and published Stanford research	Included
Opportunities for postdoc and graduate Student engagement	Included
Present at eWEAR symposium or seminar	Included
Opportunity to provide input on future focus areas	Included
Facilitated interactions with program faculty and opportunities to discuss research engagements	Included
Campus visits to discuss future directions of eWEAR research by arrangement	Included
Stanford eWEAR Advisor role	Included
Summary of Stanford patents in key areas of interest to member	Included
Professor/researchers give virtual presentation for member company	Included
Present company overview, culture, diversity to Stanford community	Included
Invitation to attend eWEAR entrepreneur pitch event	Included
Investment areas shared with eWEAR distribution lists	Included
Recruiting session with students/post-docs, facilitated by Stanford ChemE Dept.	Included
Support for one student/postdoc (fellow-mentor-advisor) OR Support of a focused area OR Sending one Visiting Scholar OR Workshop on a topic of interest	Not included, <i>can add on at any time for additional cost</i>

***We welcome more
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Our Team



Zhenan Bao
Faculty Director



Xiang Qian
Co-Faculty Director



Angela McIntyre
Executive Director



Katryna Dillard
Program Manager

Contact Us



ewear.stanford.edu



wearable-electronics@stanford.edu



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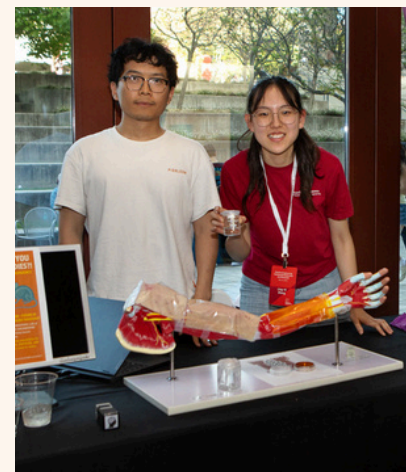
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Stanford Wearable Electronics Initiative