

New 3D body-mapping tech helps consumers, the environment

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3D printed body forms are part of the College of Human Ecology's Cornell Digital Fashion BodyScan Laboratory, where Jie Pei developed technology that helps improve clothing fit and design. Credit: Noël Heaney/Cornell University

Online shopping for clothing offers consumers convenience but comes with some notable downsides for them and the environment. Size and fit issues often prompt consumers to return the items, which leads to increased carbon costs.

New body-mapping technology developed in the Cornell University College of Human Ecology's Department of Human Centered Design (HCD) aims to solve those problems, by improving garment design and fit, while helping customers choose the right size for their unique shape.

"Women typically buy two or three sizes of the same garment, intending to keep one and send the rest back," said Jie Pei, who developed the technology for her dissertation in the field of fiber science and apparel design. "Originally I thought, "Well, it's not a waste, because they're sending stuff back." But the problem is, most of the time, it's more expensive for companies to put those products back into storage, so those returns end up in a landfill. And that's a huge waste."

Cornell has licensed three patents for the technology to FIT:MATCH, a retail technology company where Pei now works as a senior data scientist. Two of the patents are co-credited to Susan Ashdown, professor emerita fiber science and apparel design in the College of Human Ecology (CHE).

To collect and analyze data for her dissertation, Pei used a 3D body-scan database, a full-body laser scanner, and software that are housed in the Cornell Digital Fashion & Body Scan Research Lab, directed by Fatma Baytar, assistant professor of fiber science and apparel design in CHE.

According to Baytar, the combination of faculty expertise and state-of-the-art equipment makes HCD a global leader in producing advancements like these in apparel design.

"We have faculty with backgrounds in design, engineering and fiber science, and we have the newest technologies, which attract renowned researchers and very smart, talented students from all over the world," Baytar said. "Like Pei, when they leave our program, they have design training and they are digital natives who can use 3D software and body

scanners, and work with a huge number of data points from the databases they accessed in their time here."

The first patent is for a 3D mapping technology that helps companies find the most representative shape for a population of a specific size; it also assists consumers in choosing garments and sizes most likely to fit their shape. The size of the garment is only one aspect of the fit, as body shapes vary significantly even within a single size, Pei said.

"Other app-based body scanning technology on the market extract [body measurements](#) such as bust circumference from 3D images, but those measurements alone don't tell you how a garment will fit," Pei said.

"Two bodies can have the same bust and waist circumferences, for example, but drastically different shapes that will affect how a garment fits."

Pei's second invention spearheads the processing of 4D body scans, where the fourth dimension is time, to study the movement of breasts in physical activities. The technology enables advancements in the design and evaluation of bras, sports bras and a range of personal protective equipment. Around 85% of women experience fit issues in bras, contributing to problems such as neck, back and shoulder pain, Pei said.

The third invention is an algorithm for converting 3D body scans to custom-fit garment patterns that rely solely on the unique 3D geometry of the body, regardless of body type.

"Technology like this is going to help us reduce the carbon footprint associated with online shopping and improve customer satisfaction," said Baytar. "We're still talking about mass production, but at some point, it may turn into a system that is going to be more like mass customization."

FIT:MATCH recently signed contracts with two multibillion dollar retailers: Savage X Fenty, the singer Rihanna's company, and Fabletics, an activewear retailer founded by actress Kate Hudson, according to Haniff Brown, FIT:MATCH founder and CEO.

Pei said the interdisciplinary focus of fiber science and apparel design—now part of HCD—prepared her to succeed in an industry that requires data scientists, engineers and fashion designers to collaborate.

"The power of merging fiber science and design is really critical, because you have to have both sides—engineers and designers—listen to each other. Learning to communicate when you've been trained in completely different languages is a big deal."

Provided by Cornell University

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