

SUSTAINING MEMBER

ARIZONA STATE UNIVERSITY

Portable, low-cost sensing technologies for better health

Most people know that to lose weight, you need to burn more calories than you consume. The number of calories in a piece of food stays the same no matter who eats it. But everyone burns calories at a different metabolic rate, which varies by age, sex, muscle mass, health conditions, medications and genetics.

Arizona State University professor Erica Forzani and her colleague NJ Tao developed the first portable, wearable metabolic rate analyzer. The device, Breezing, uses an individual's breath to accurately determine their metabolic rate during exercise or at rest.

Breezing works via indirect calorimetry, the preferred measurement method of the American Dietetic Association, World Health Organization and other institutions. Traditional indirect calorimeters are bulky, difficult to use and usually found only in doctors' offices. Breezing replaces that with a simple, handheld device based on advanced sensor technology.

The associated app then provides personalized diet and exercise recommendations. In a published clinical study, patients using Breezing experienced over three times more weight loss and 70% better adherence to healthy behaviors, with significant improvements in blood sugar, cholesterol and blood pressure.

Forzani is a professor in ASU's School for Engineering of Matter, Transport and Energy, deputy director of the Biodesign Center for Bioelectronics and Biosensors, and director of the ASU-Mayo Clinic Medical Devices and Laboratory Methods at Health Futures Center.

Forzani's lab creates use-inspired, smart and wearable health technologies, combining artificial intelligence with point-of-care, home-use, passive and unobtrusive detection.

Working with Mayo Clinic, Barrow Neurological Institute, Arizona Wear Tech Center, Amazon and other industries and health care enterprises, the lab develops wearable sensors to track metabolic rate and lipid metabolism, environmental wearable

sensors for detection of toxicants, and smart sensors for human performance. The researchers use cell phones to generate home-use and point-of-need sensors, and to diagnose cognitive decline with smart sensing devices embedded in automobiles.

During the COVID-19 pandemic, Forzani collaborated with Mayo Clinic to develop three new solutions to prevent aerosol spreading of SARS-CoV2 in hospitals and other health care facilities. The solutions, called Aerosol Barrier Solutions, have been patented and licensed to TF Health Co., Breezing's parent company.

Forzani also co-founded Sequitur Health Corporation with ASU colleague Mary Laura Lind and Mayo Clinic physician Leslie Thomas. The venture focuses on medical devices for disease diagnosis with biomarker detection in bodily fluids. The technology is based on two ideas for which Forzani and her colleagues have been granted intellectual property rights.

Forzani has published more than 120 peer-reviewed articles, book chapters and reviewed conference proceedings. She holds 10 U.S. patents and 19 international patents, co-founded multiple startups, and has licensed seven technologies that have been pursued as medical devices or new medical methods. She also mentors other health technology entrepreneurs through the ASU-Mayo Clinic MedTech Accelerator.