

# Researchers develop smart sensing device to monitor sleep and health

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Researchers in the University of Georgia College of Engineering have developed a smart sensing device designed to improve care for the elderly by providing real-time safety and health monitoring during sleep.

BedDot is a contact-free sensor system that continuously monitors a person's sleep patterns and vital signs—and generates real-time alerts to loved ones or caregivers when urgent changes occur, such as falls from bed. BedDot is the first device to detect [heart rate](#), [respiration rate](#), sleep movements, sleep posture, and falls using only vibration sensing, according to the researchers.

"BedDot will help seniors by improving the quality of their health care, whether they live in their own homes or in assisted-living facilities," said WenZhan Song, the Georgia Power Mickey A. Brown Professor in the College of Engineering. "If an elderly person gets out of bed in the middle of the night and falls, there is a risk no one will find them until the next morning. In these cases, BedDot can issue an alert, giving the facility, the resident and their family peace of mind."

According to the U.S. Census Bureau, there are approximately 56 million Americans age 65 and older—a number that's expected to increase to 70 million by 2030. Among this group, the population over 85 years of age is the fastest-growing segment.

The research team received the Mark Weiser Best Paper Award for its work at the recent Institute of Electrical and Electronics Engineers (IEEE) International Conference on Pervasive Computing and Communications, held virtually because of the COVID-19 pandemic. In addition to Song, the team includes Jose Clemente and Maria Valero, UGA Ph.D. graduates (2019); Fangyu Li, UGA postdoctoral researcher; and ChengLiang Wang, an associate professor at Chongqing University in China.

BedDot's components include a smart seismometer with computing and communication capabilities. The small device, approximately the size of a half-gallon carton of ice cream, connects to a bed frame and transmits data via WiFi to the cloud. A user-friendly graphic interface allows users

and caregivers to see movement patterns, sleep quality, fall alerts, changes in sleep posture, and more on a computer or smartphone. The system can connect to smart home systems, such as Google Nest, and automatically call for emergency assistance—unlike other alert systems that require the user to press a button to activate an alert.

The researchers tested the accuracy of BedDot's heart rate and respiration rate monitoring using FDA-approved wearable devices, such as Apple Watch Series 4. They found the system's heart rate measurement matched that of the Apple Watch by +/- 2.41 beats-per-minute, and its respiration rate measurement was within one breath per minute compared to an FDA-approved oximeter. In addition, BedDot demonstrated a 99.5% accuracy in detecting bed entries, 99.73% in detecting bed exits, and 97% in detecting falls from bed.

Song and his team received support from UGA's Innovation Gateway as they refined BedDot. Their related startup company, Intelligent Dots LLC, and UGA have received a \$225,000 Small Business Technology Transfer grant from the National Science Foundation ([www.nsf.gov/awardsearch/showAward?AWD\\_ID=1940864](http://www.nsf.gov/awardsearch/showAward?AWD_ID=1940864)) to further develop the technology. Brad Philips, an expert in sleep studies and director of UGA's Clinical and Translational Research Unit, will lead [clinical studies](#) and system validations in senior care facilities.

The researchers are also exploring the possibility of adding [blood pressure](#) monitoring to BedDot's capabilities.

**More information:** Helena: Real-time Contact-free Monitoring of Sleep Activities and Events around the Bed: [sensorweb.engr.uga.edu/wp-content ... Percom Revised.pdf](http://sensorweb.engr.uga.edu/wp-content...Percom_Revised.pdf)

Provided by University of Georgia

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