NIT Rourkela develops multi-sensor AI system for accurate sleep posture detection

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Poor sleeping posture can cause long-term health conditions such as chronic musculoskeletal pain, spinal degeneration

Researchers at the National Institute of Technology (NIT) Rourkela have developed an artificial intelligence (AI)-enabled system that can track human sleep postures. This is useful in healthcare settings, as it provides a non-intrusive way to monitor patients while maintaining their privacy, even when they are covered with a blanket.

Studies from around the world show that poor sleeping posture can cause long-term health conditions by putting sustained, uneven pressure on the spine, joints, and nerves for hours at a time.

Currently, patient posture monitoring is mostly done manually, which can be inconsistent and prone to human error. Although wearable sensors can be an option, but they are uncomfortable and costly for the end users. Additionally, some systems use cameras, however they can be limited by factors including insufficient lighting, obstructions such as bed covers, and privacy issues.

To address these limitations, researchers have developed an AI-based system that uses three types of sensors: An imaging sensor in the long-wave infrared spectrum that captures and uses body heat to track sleep postures, and does so without using visual data, even if the subject is covered by a blanket; A depth sensor that captures the shape and posture of a

person; A pressure sensor that assesses how the weight is distributed on the bed.

To process the data from these sensors, the team developed a generative AI model to represent the human body, and a graph-based neural network to classify the various postures of body joints.

By combining heat-based imaging, body shape data, and pressure information, the system can deliver accurate results. Lab experiments show that this no-contact model achieves around 98% accuracy, making it reliable for real-world use.

To be used as an integrated module with multi-modal imaging systems, the approximate cost of the developed technology will be Rs 30,000, with scope for further reduction with mass-scale development.

As a next step, the research team plans to extend the usage of this technology for identification of specific incorrect sleep posture-related health issues and other diseases.