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## **Precision Gait Stability Analysis Combining Hardware and Software**

K. L. Jeevanesh<sup>1</sup>, V. Karthikeyan<sup>2</sup>, R. Prasanna Kumar<sup>3</sup>, N. Sathish<sup>4</sup>

Students, Department of Electronics and Communication Engineering<sup>1,2,3</sup> Assistant Professor, Department of Electronics and Communication Engineering<sup>4</sup> Sri Venkateswara College of Engineering, Chennai, India

**Abstract**: Maintaining stable gait and avoiding falls require effective control of the body's center of mass (CoM) relative to the base of support (BoS), defined by the feet's contact points with the floor. Quadrupeds have an advantage over bipeds but share common spinal neural control mechanisms. Human walking poses stability challenges since the CoM often extends beyond the BoS. This project aims to monitor gait stability by integrating advanced hardware and software solutions. Machine learning algorithms, such as Random Forest, will be employed to predict gait instability by capturing foot positions and sensor data. Inertial measurement sensors will track stability changes, and hardware outputs will be validated against software predictions for accuracy. A mobile app developed using React Native will display predicted parameters and indicate gait instability (yes/no). In case of detected instability, a wearable buzzer will alert the user. This system promises a more accurate solution for monitoring gait stability compared to existing models, by combining real-time data collection and sophisticated algorithms

Keywords: Precision Gait stability, Random Forest Algorithm, Parkinson disease, Machine Learning Algorithm

