

## ABSTRACT

Elderly individuals, particularly those aged 65 and above, face a high risk of outdoor falls due to the weakening of physical conditions, such as declining vision and balance. Statistics reveal that approximately 30% of the elderly in America and 30-50% in Indonesia experience falling incidents each year. Fall prevention in the elderly is crucial as falls can lead to serious injuries like fractures, brain trauma, and even death.

Various efforts have been made, such as the implementation of the Balance Enhancing Exercise Program (BEEP) and Walking Meditation (WM). However, there is still a lack of a tool that can provide immediate warnings to the elderly during potential fall-inducing situations. Therefore, this CD aims to develop a fall prevention system for the elderly that can issue alerts when events with potential fall risks occur and notify caregivers when an elderly person experiences a fall incident.

The human activity recognition model has achieved a 95% accuracy using the XGBoost method and feature extraction. The notification for a movements that tends to fall demonstrates 100% accuracy using the acceleration threshold on the x-axis during walking. Monitoring the elderly's location using GPS, GSM, Firestore, Firebase Cloud Messaging, and BLE shows an average delay of 9.68 seconds and an average distance error of 6.87 meters. However, improvements in human activity recognition are necessary for seamless integration with the fall prevention system.

Keywords: Elderly, fall prevention, machine learning, GSM