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In Collaboration with

UNIVERSITY OF WESTMINSTER

*“ElderMax”*

**Multi-model Fall identification system using anomaly detection**

A Dissertation by

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Keywords: anomaly detection, human activity recognition, multimodal

## **Abstract**

Elderly Fall detection is a domain that is widely researched in the research community. Over the years fall detection systems have evolved to adopt different techniques and methodologies to improve performance of the systems. Many researchers from different countries have proposed different techniques and systems that gives good performance with the environmental conditions and stakeholders of their countries. A fall is a rare phenomenon which can be considered as an anomaly when compared with other daily activities. A fall might cause severe injuries or be fatal to humans at times, but for elderly people (65 years and above) a fall has a very high probability of causing severe injuries or be fatal. Therefore researchers have tried to address this problem and find solutions. Out of the publicly available datasets to implement fall detection systems majority of the datasets contain simulated actions and activities performed by young volunteers. The author of this research project was inspired to propose a novel fall detection system that can not only detect falls using state of art methods but also be well adopted to Sri Lanka and countries with similar factors and conditions. Therefore the author of this research has taken all these factors into consideration and proposed a novel multi modal fall detection system that uses Depth data from Microsoft Kinect Sensors and Tri-axial Accelerometer Data to determine the occurrence of a fall by applying state of art anomaly detection techniques. This system not only gives great attention to human activity recognition details but also addresses the user concerns such as privacy protection, system performance, practicality of the solution and also the adaptability of the solution to a country like Sri Lanka. Proposed system has an accuracy of 92.6% , Sensitivity of 89.2% and Specificity of 95%.

**Keywords:** Multi Modal, Fall Detection, Tri-axial Accelerometer, Microsoft Kinect Sensor, Depth Data, Accelerometer data, Anomaly Detection, Autoencoders, Sri Lanka, Un-supervised Machine learning