

FLEXIBLE, WIRELESS SMART WEARABLE MICRO-ELECTRONICS FOR FALL RISK MONITORING AMONG OLDER ADULTS

Mariam Jabr

*College of Engineering
Natural Sciences & Engineering Poster Presentation*

Abstract: Falling presents a serious health issue and financial burden for elderly people aged 65 years or older. According to the WHO Global Report, 28%-35% of adults 65 years or older experience fall related injuries more than once per year. The CDC has also reported that more than \$50 billion is spent on fall related injuries every year, which calls for the need of an automatic fall detection system for older adults. Current fall detection systems are classified into wearable and non-wearable systems. Non-wearable systems include camera-based systems; however, these systems have very complex setups, are highly expensive and are area constraint. Wearable systems use accelerometers and gyroscopes to obtain motion data; however, they are usually bulky and/or visually displeasing for older adults. Therefore, the overall objective of this research is to design a fall detection system using flexible, wireless smart micro-electronics which offer accurate fall detection and user comfort for long-term use due to their skin-like properties. To achieve this objective, the following specific aims were accomplished. 1) The smart skin-wearable device was designed and fabricated using microfabrication techniques. 2) Motion data was collected from 10 participants (5 younger adults aged 20-30 years and 5 older adults aged 65 years or older). Participants were instructed to perform 5 different human activities (falling, running, sitting, walking, and stairs to collect linear and rotational motion data. 3) Various deep-learning models (CNN, LSTM, CNN-LSTM, and ConvLSTM) were explored to train the data for accurate fall detection. The highest accuracy so far achieved among all models is 89%. Current work on this study includes optimizing hyperparameters of deep-learning models to achieve highest performance and accuracy. Deep-learning models will be compared to create the highest performance algorithm in order to achieve the automatic fall detection system.

Faculty Mentor: *Yongkuk Lee*