Abstract

Falls remain the most common cause of injury among the geriatric population. These falls can cause numerous consequences to their health, as it causes bone perturbations, fractures, and breaks, leading to not only decreased quality of life post-injury, but also costly medical fees. There is a need to utilize preventative and rehabilitation programs to reduce risk of geriatric falls, but there is a lack of biomechanical research to support the development of such programs. With this, our project aims to develop an artificial-intelligence tool that can predict a patient's risk of anterior, posterior, medial, lateral, and collapse-directed falls through the analysis of joint movements. First, videos of mimicked falls were taken using a LiDAR L515 camera, an infrared camera with specific depth perception, and Cubemos SDK, a skeletal tracking software. The combination of the two allowed for the tracking of XYZ coordinates of each joint over time, which were used to train a Python-based neural network using a Sigmoidal weighted learning curve to output a 6 by 1 matrix predicting the likelihood of a fall mechanism in a patient at each frame. Using this produced dataset (n = 50 for each type of fall), the accuracy of this model was tested, which was determined by calculating the percent difference of the output to what was expected at each time frame. With the current dataset, a percent accuracy of 32% was achieved, although this should improve with more data. We offer a proof-of-concept tool that can be employed by physical therapists to develop training regiments and evaluate their effectiveness.