A FALL DETECTION SMART WATCH USING IOT AND DEEP LEARNING

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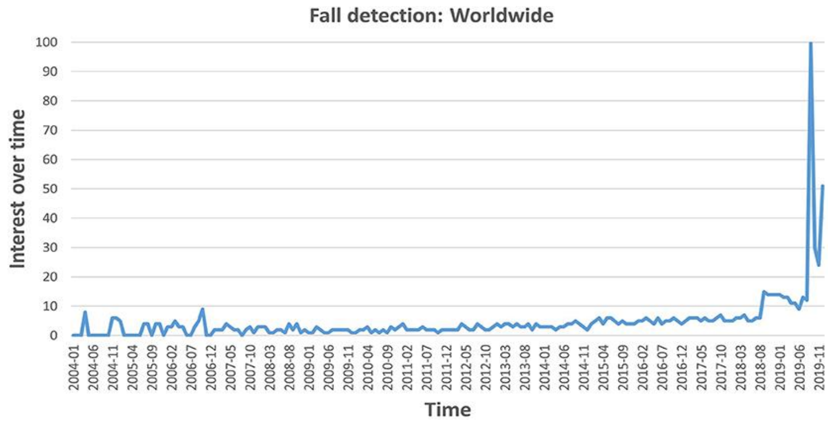
ABSTRACT

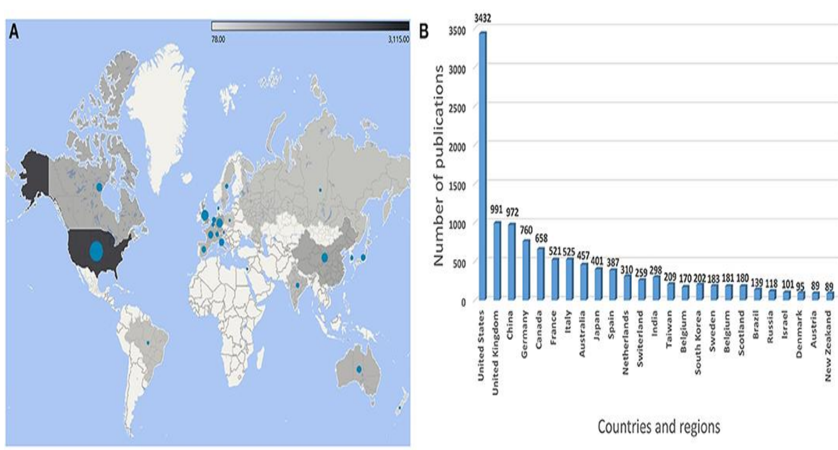
(IoT) are the main techniques that have been developed to gather various information data for different services and application. Monitoring of elderly and disabled people is very challenging and due to accident which may occur due to some activities like falls. In smart homes fall is considered as the main reason for death of post traumatic complication by using artificial intelligence(AI),Internetofthings,wearables,smartphones etc.we can avoid this issues.this will helps the survival rate of the person who needs help.This leads to a suitable design fall detection system for smart homecare.In this paper we are trying to implement an IoT enabled elderely fall detection model using optimal deep convolutional nuero network for smart homecare(IMEFD-ODCNN) for smart home care.The main aim of the IMEFD-OCDNN model is to enable smartphones and intelligent deep learning algorithms to detect the event of falls in the smarthomes.Falling is among the foremost damaging event elderly people may experience. With the ever-growing aging population, there's an urgent need for the event of fall detection systems. due to the rapid development of sensor networks and also the Internet of Things (IoT), human-computer interaction using sensor fusion has been considered a good method to handle the matter of fall detection

INTRODUCTION

In recent years, the net of Things (IoT) and mobile communication find useful in healthcare sector. With an enhanced healthcare system in several countries, average life has developed considerably. Plus lower natural increases lead to an elderly population that will need appropriate care and more interest. But, in several countries, offering appropriate care may well be challenging due to several reasons. The impaired and elderly populations would shortly sleep in smart homes [1], [2]. These homes offer a pleasing and safe place for the elders. Independently, security is considering the most concern within the smart healthcare model [3]. However, daily emergency incidents also will still occur because of seniors' attribute. Falling is that the commonest problem encountered by elder peoples. For elder adults, a fall might be highly risky and might cause serious health issues. Additionally, lack of balance and fall could be symptoms of a life-threatening disease. Nevertheless of the cause for a fall, it may be critical if it happens, the injured people must obtain quick help. Frequently, the individual won't be ready to get up with no support and might require immediate medical consideration. over nine percent of the population of China was aged 65 or older in 2015 and within 20 years (2017–2037) it's expected to achieve 20%1. in line with the globe Health Organization (WHO), around 646 k fatal falls occur every year within the world, the bulk of whom are suffered by adults older than 65 years (WHO, 2018),followed by road traffic injuries. Globally, falls are a significant public pathological state for the elderly. Needless to mention, the injuries caused by falls that elderly people experience have many consequences to their families, but also to the healthcare systems and to the society at large. As illustrated in Figure 1, Google Trends2 show that fall detection has drawn increasing attention from both academia and industry, especially within the last few years, where a increment are often observed. Moreover, on the identical line, the subject of fall-likelihood prediction is extremely significant too, which is not to mention some applications focused on prevention and protection.



During the past decades, much effort has been put into these fields to enhance the accuracy of fall detection and prediction systems yet on decrease the false alarms. Figure 2 shows the highest 25 countries in terms of the quantity of publications about fall detection from the year 1945 to 2020. Most of the publications originate from the u. s., followed by England, China, and Germany, among others. the info indicates that developed countries invest more in conducting research during this field than others. because of higher living standards and better medical resources, people in developed countries are more likely to possess longer lifespan, which ends up in an exceedingly higher aging population in such countries (Bloom et al., 2011).



In this survey paper, we offer a holistic overview of fall detection systems, which is aimed for a broad readership to become abreast with the literature during this field. Besides fall detection modeling techniques, this review covers other topics including issues per data transmission, data storage and analysis, and security and privacy, which are equally important within the development and deployment of such systems.

RELATED WORK

Hussain et al. [11] presented a wearable sensor based continuous fall monitoring scheme that may detect falling and identify fall patterns and therefore the activity associated with fall incidents. A series of studies using three machine learning approaches, such as RF, KNN, and SVM, are used to assess the efficiency of the provided system. On real-time fall and non-fall datasets, Aziz et al. [12] investigated the accuracy of fall detection schemes deepening. Wearing tri axial accelerometers, the five younger and nineteen older people went about their daily activities. At the time of data collection, twelve elderly people fell unexpectedly. Around 400 hours of ADL are recorded. For identifying falls and non-fall activities, they used ML and SVM classification. With the help of LSTM-NN, Shojaei-Hashemi et al. [13] suggested a DL-based technique for detecting human falls.. Tsinganos and Skodras [14] developed a smartphone based fall detection scheme that might differentiate among ADL & falls. the standard fall detection scheme contains notification module and sensing component. Android devices, armed with communication services and sensors, are optimal candidates for the expansion of this method.

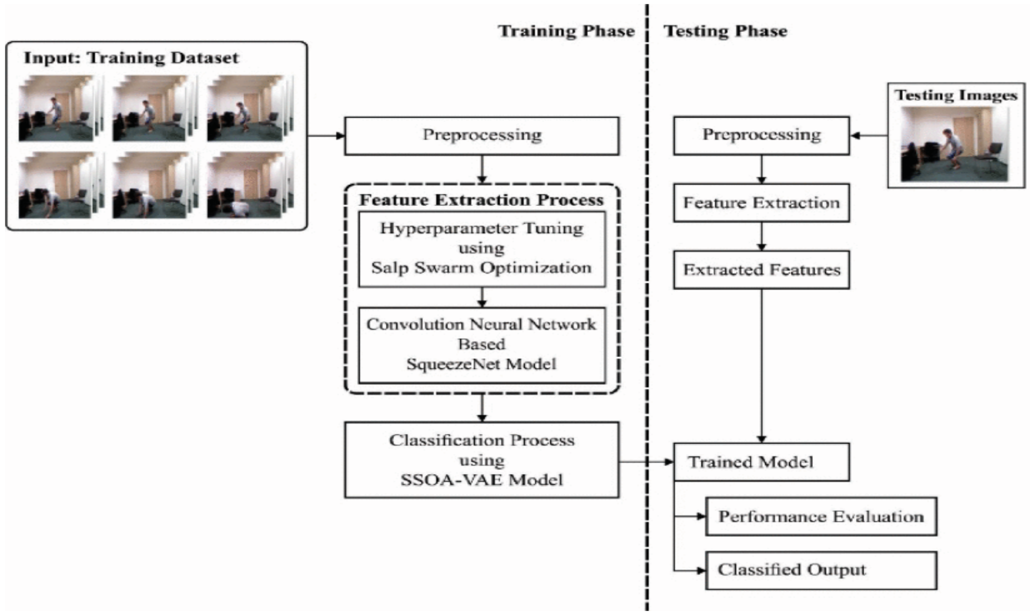
. In Liu et al. [15], a sensing module combined energy efficient sensor was established that might sense and store the data of human activities from sleep mode, and interrupt driven technique is presented for transmitting the information to a server combined with Zigbee. Next, an FD-DNN operation on the server is meant carefully for detecting accurate falls.

In Kong et al. [16], a HOG-SVM based fall detection IoT scheme for elder adults was presented. For ensuring privacy and robust modifications of the sunshine intensity, deep sensor is used instead of RGB camera for getting binary images of elder adults. Afterward attaining the denoised binary images, the features of person are extracted using the histogram of oriented gradient, and therefore the image classification is executed to guage the autumn condition using linear SVM. Carletti et al. [17] proposed a brand new smartphone based fall detection scheme that considers falls as abnormalities regarding a module of usual events. This system is said to other methods and it's demonstrated to be appropriate to control on a smartphone located within the trouser pockets. This outcome is established from the attained accuracy and essential hardware assets. Mrozek et al. [1] proposed a scalable framework of a scheme that would observe 1000s of elder persons, identify falls, and inform the care takers. Scalability test discloses the requirement for enabling large scale scheme processes are executed. Furthermore, they authenticated various ML modules for evaluating their appropriateness within the detection procedure. Amongst the tested modules, Boosted Decision Tree leads to the optimal classification efficiency.

. Information from smartphones and wearables is merged into [18] to improve categorization accuracy. There are no publicly accessible datasets that incorporate data from cellphones and smartwatches. The information would be collected separately from now on. The falls would be classified using the DT (J48) classification. Gia et al. [19] advocated that lightweight, small, energy-efficient wearable, and multifunctional devices be implemented. Despite the fact that numerous approaches are accessible in the literature, it is necessary to investigate how several variables (such as transmission protocol, communication bus interface, transmission rate, and sampling rate) affect the wearable device's energy consumption. They also provide comprehensive evaluations of the wearable's energy consumption in various setups and operational conditions. It also makes recommendations (both software and hardware) for building the best wearable device for IoT.

PROPOSED SYSTEM

The suggested system fall detection model is processed using a smart watch.Smart watches and intelligent DL algorithms can detect falls in the smart home using the IMEFD-ODCNN model.The proposed IMEFD-ODCNN model includes data gathering, pre-processing, SqueezeNet-based feature extraction, SSO-based parameter adjustment, and SSOA-VAE-based classification.The input movies are collected initially, then uploaded to a cloud server for further processing, where the proposed model is run.To improve the quality of the video frames, they are separated and pre-processed at three levels: resizing, augmentation, and normalisation.The characteristics from the video frames are then extracted using the SqueezeNet model to deliver meaningful results.



To increase the quality of the video frames, they are split and pre-processed at three levels: scaling, augmentation, and normalisation. The features from the video frames are then extracted using the SqueezeNet model to produce meaningful feature vectors. The SSO method is also used to tune the SqueezeNet model's hyperparameters. Following that, the feature vectors are loaded into an SSOA-VAE based classifier model to identify falls. The next steps will be determined by the classification results.

Based on the classification outcome's value, the following actions are taken: When a fall is detected and classified as a class 1 event, an alarm is sent to the patient device, and the caregiver is immediately notified if the fall was not excluded from the application by the monitored person. When a non-fall event is identified and represented as class 0, no alert is triggered and the occurrence of the event is disregarded. Physicians and caregivers might monitor the elderly in real time using backend technologies from faraway locations. Furthermore, the backend technology assists doctors in treating diseases by providing data and patient history.

CONCLUSION

This opinion article allows for the development of new viewpoints on the use of contemporary technology for the prevention and detection of falls in older individuals, and it emphasises that this topic is complicated and goes well beyond technological challenges. Although there is a growing interest in improving older adults' access to new technologies, little research has taken into account the wide range of factors that contribute directly or indirectly to the digital divide, and thus the factors of acceptability unique to the older adult population that are critical in the adoption of those tools. Further work should include undertaking systematic and scoping reviews addressing more particular problems, such as clinical trials testing the impact of fall detection technologies and systems in frail older persons or specialised in ergonomic studies that take acceptability aspects into account. To promote active and independent ageing, it's critical to promote the use of specific assistive and preventive technologies by spreading positive messages about their benefits and ensuring that these technologies are simple to use, dependable, effective, and tailored to the needs of older individuals [7].

Both technological and human barriers need for greater multidisciplinary and collaborative work among the different actors and stakeholders, including users, family caregivers, physicians, and researchers from the fields of computer science, clinical sciences, and humanities.

Finally, while efforts are being made to improve the feasibility and acceptance of digital devices outside of the laboratory, few studies have evaluated their usefulness in the "real world" of older persons drawn from the ultimate demographic.

Following the primary step of developing a wide range of devices that are relatively accessible in terms of use and value, the second necessary step is to evaluate these devices in large samples of older adults in ecological contexts if we want these tools to be more than just technological prototypes but operational allies that are truly effective in promoting active ageing and improving the quality of life of older adults experiencing frailty or loss of autonomy.

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