بسم الله الرحمن الرحيم

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Human Activity Recognition Based on Machine and Deep Learning Approaches

A thesis Submitted as Partial Fulfillment of The Requirements for The Degree Of Master Of Science in Computer And Information Sciences.

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Abstract

Human Activity Recognition (HAR) is one of the most important applications that can contribute to helping abnormal patients. Recognizing activities or movements collected by sensors can help in surveillance and security applications. Therefore, two main proposed approaches are developed based on machine learning and deep learning approaches. Each approach consists of four main phases namely data collection, preprocessing, feature extraction and classification. During the data collection phase, data is pulled from an online dataset. The data set consisted of six key movements from 30 participants. In the next stage, filtering is applied to the activity data collected from the sensors. The data is passed to a Butterworth low-pass filter to be filtered. Then in the feature extraction phase, the proposed machine learning method applies the feature selection method to get the most obvious features, while in the proposed deep learning method, the three methods The primary RNN is applied based on long-term short term memory (LSTM), bidirectional long term short memory (Bi-LSTM), and gated recurrent unit (GRU). Finally, the classification step in the proposed machine learning method is based on the genetic algorithm (GA), naive bias (NB) and J48, while in the deep learning method the classification is based on the K- nearest neighbor (KNN), support vector machine (SVM), random tree (RT), random forest (RF) and artificial neural network (ANN). Highest performance achieved using Bi-LSTM combined with ANN achieving 97.2% accuracy.

List of Publications

1- Alhumayyani, M. M., Mounir, M., & Ismail, R., Smartphone-based Recognition of Human Activities using shallow Machine Learning., International Journal of Advanced Computer Science and Applications, Vol 12, No. 4, 2021 (pp. 77-85). (Japan)

2- Alhumayyani, M. M., Mounir, M., & Ismail, R. (2021, December). Deep Learning Methodologies For Human Activity Recognition. In *2021 Tenth International Conference on Intelligent Computing and Information Systems (ICICIS)* (pp. 396-406). IEEE (Egypt)

3- Alhumayyani, M. M., Mounir, M., & Ismail, R. (2021). Machine and deep learning approaches for human activity recognition. *International Journal of Intelligent Computing and Information Sciences*, *21*(3), 44-52. (Egypt)

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