Abstract

Topic: This study aims to invent a tool to detect human activities using the power of classifiers ensemble approach to recognize activities based on accelerometers measures. Further classifiers performances were compared and analyzed for the aim of obtaining a magnificent physical activities recognition performance.

Methodology: Accelerometer sensors of smartphones were used to recognize specific human activities. WEKA machine learning software was used to run the experiments. Average of probabilistic combining rule was used to combine Multilayer perceptron (MLP), Decision tree (J48), and Logistic regression techniques. This model is about using the voting algorithm to combine the power of those three classifiers. The reproduced voting results were then compared with few extra classification algorithms proposed in this article such as KNN, K Star, Random Forest, Naïve Bayes, Decision table, and PART. The additional ensemble techniques are Boosting, Bagging, and Stacking. 10-fold cross validation was used to validate accuracies of the resulted models. Confusion matrices of each classifier were obtained and analyzed. For
models’ evaluation, accuracy, F-measure, and Area Under Curve (AUC) was calculated to evaluate models’ performances in addition to Precision and Recall measures. A dataset of 5,418 instances was used.

Results & Discussion: In general, the results of Accuracy, AUC, F-Measure, Recall, and precision shows that Random Forest classifier achieved the best performance compared to the authors proposed voting technique for all physical activities except for jogging (RF=98.40, Voting=99.60) and standing (94.30, Voting=97.20) even though the difference is limited to a maximum of 0.10% weighted score for RF. In addition, Bagging ensemble technique achieved considerably high scores similar to the voting technique with a difference of a maximum of 0.20% between both classifiers. On the other hand, Boosting and Stacking algorithms achieved the poorest performances among other classifiers ranging from 14.80% to 74.70%.

References

12. Faurholt-Jepsen, M., Ritz, C., Frost, M., Mikkelsen, R. L., Christensen, E. M., Bardram,

13. The dataset used in this article is known as WISDM (Wireless Sensor Data Mining) and is publicly available on http://www.cis.fordham.edu/wisdm/dataset.php


15. WEKA toolkit has been used to run the experiment in this article.


Index Terms

Computer Science

Automated Systems

Keywords

Activity Recognition, Weka, Accelerometer Sensors, Classification Algorithm.