**MULTI-SENSOR-BASED ACTION MONITORING AND RECOGNITION VIA HYBRID DESCRIPTORS AND LOGISTIC REGRESSION**

**ABSTRACT: -**

The increasing popularity of wearable devices like smart watches, smart phones, and wristbands has generated a need to analyze user patterns and activity relationships. This study utilizes the MHHBA Physical Activity Monitoring dataset, consisting of data from 12 different physical activities performed by 10 subjects wearing 3 inertial measurement units and a heart rate monitor. The dataset is invaluable for activity recognition, intensity estimation, and the development of algorithms for data processing, segmentation, feature extraction, and classification. To enhance accessibility, the original data has been transformed by adding a new column called "PeopleId" and merging all the datasets into a comprehensive CSV file. Leveraging this enriched dataset, we apply machine learning techniques to accurately predict the specific activity a user is engaged in. We employ the K-Nearest Neighbors (KNN) algorithm, Decision Tree algorithm, Principal Component Analysis (PCA) for feature reduction, and Grid Search CV for hyper parameter tuning.

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| **EXSISTING SYSTEM** | **PROPOSED SYSTEM** |
| * The existing system focuses on Physical Activity Recognition and Measure (PARM) in controlled environments using traditional data fusion techniques. These techniques process ambient and wearable sensing data to classify types of physical activity and enhance recognition accuracy. However, they have limited applicability in open and dynamic IoT environments. * The emergence of IoT technology has enabled the connection of cost-effective wearable devices and mobile apps, creating new challenges for PARM studies. The existing system lacks knowledge about how traditional data fusion techniques can address these challenges and effectively utilize IoT technologies. Therefore, there is a need to explore IoT-based PA data acquisition models for PARM applications. | * In this study, we propose a system that utilizes machine learning techniques to predict the specific activity a user is engaged in, based on the MHHBA Physical Activity Monitoring dataset. The dataset consists of data from 12 different physical activities performed by 10 subjects wearing wearable devices such as smartwatches and wristbands. * To enhance accessibility, we have transformed the original data by adding a new column called "PeopleId" and merging all the datasets into a comprehensive CSV file. This enriched dataset serves as the foundation for our activity prediction system.We employ the K-Nearest Neighbors (KNN) algorithm, which classifies activities based on the similarity to labeled instances. Additionally, we utilize the Decision Tree algorithm. |
| **EXISTING ALGORITHM**   * IoT-based PA Data Acquisition model | **EXPECTED PROPOSED ALGORITHM:**   * KNN & Decision Tree with PCA & GridSearchCV |
| * The IoT-based PA data acquisition technique utilizes sensors embedded in wearable devices to collect real-time data on various types of physical activity. These sensors capture information such as movement patterns, heart rate, and acceleration. The collected data is then transmitted wirelessly to a central processing unit or a cloud-based platform for analysis. * Data fusion techniques are employed to process and combine the sensor data from multiple sources. This fusion allows for improved classification and identification of different types of physical activities. Machine learning algorithms, such as neural networks or decision trees, are often applied to analyze the fused data and make accurate predictions about the performed activities. * Furthermore, the technique incorporates a timeline aspect, which considers the temporal dimension of physical activity. By tracking and analyzing the sequence of activities over time, it enhances the understanding of activity patterns and behavior. | **ALGORITHM DEFINITION: -**   * The KNN algorithm classifies activities based on similarity to labeled instances, considering the "k" nearest neighbors. By calculating the distance between instances in the reduced feature space obtained through PCA, the KNN algorithm accurately predicts activities. * The Decision Tree algorithm constructs a tree-like model that splits the data based on different features to make predictions. By using the enriched dataset, the Decision Tree algorithm can effectively predict activities based on the provided features. * To improve the performance of the models, we employ Principal Component Analysis (PCA) to reduce the dimensionality of the feature space. PCA transforms the original features into a lower-dimensional representation while retaining most of the important information. Grid Search CV is employed to optimize the hyperparameters of the models. It exhaustively searches the parameter grid to identify the best combination that maximizes the model's performance. * By combining these desired techniques, we achieve accurate activity prediction, enabling developers and researchers to create innovative applications and systems that cater to individual user needs based on their ongoing activities. |
| **DRAWBACKS: -**   * If any part of the infrastructure fails or experiences issues, it can disrupt the data acquisition process and hinder accurate recognition of physical activity. * Ensuring robust security measures and addressing privacy concerns are crucial for the successful implementation of an IoT-based PA Data Acquisition model. * Need of privacy concerns are crucial for the successful implementation. | **ADVANTAGES: -**   * It can optimize the model's performance and achieve higher accuracy in predicting physical activity. * It can eliminate redundant or irrelevant features, leading to improved efficiency and reduced computational complexity. * This is particularly useful in predicting physical activity, as the relationship between different predictors and activity levels can be complex and non-linear. |

**SYSTEM ARCHITECTURE:**

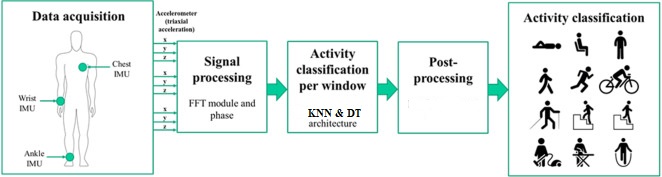


Fig:- Proposed Model

**MINIMUM SYSTEM REQUIREMENTS**

**HARDWARE REQUIREMENTS**

* PROCESSOR : Pentium i3 Processor
* RAM : 2GB DD RAM
* HARD DISK : 250 GB

**SOFTWARE REQUIREMENTS**

* BACK END : PYTHON
* OPERATING SYSTEM : WINDOWS 7
* IDE : Spyder3/ VS code
* Front End : HTML, CSS
* Framework : Django