Project

Human_Activity_Recognition

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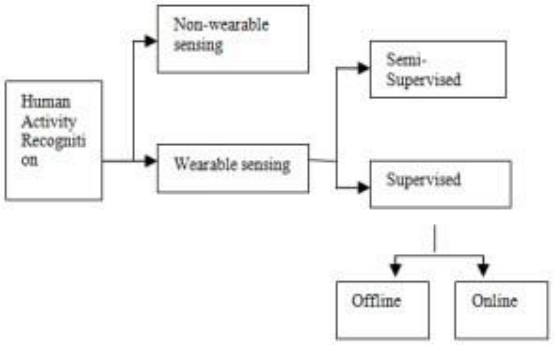
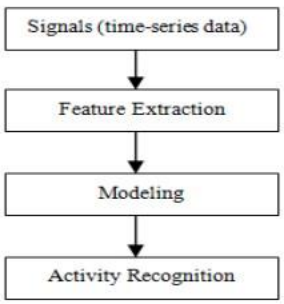
Abstract:

Activities of daily living (ADL) are used to monitor the everyday duties and movements or movement of persons who live alone. Activity recognition is also important in healthcare monitoring and surveillance systems. Monitoring and assessing daily actions is not feasible in the actual world. Sensors are utilized in household gadgets to effectively track one's behavior.

Human activity recognition is a young study subject that confronts several obstacles. It focuses on mostly health care applications and certain security applications. To identify motion and objects in human activity monitoring, computer vision-based approaches are utilized. Along with this, they primarily devote to infrastructure. Monitoring the locations, for example, using a video camera arrangement. Track one's movements utilizing worn sensors or sensors installed in one's smartphone to replace this.

Smart phones have recently played an important part in recognizing human behaviors and have become a well-known subject of research. Many applications with human-centered monitoring have been created to recognize, detect, and categorize human behavior, and researchers have presented many methods. Human activity recognition is an important technology for monitoring a person's dynamism, and it is possible to do this with the use of Machine learning algorithms. Threshold-based algorithms are simpler and quicker, and they are frequently used to detect human activity.





Project Design and Milestones:

1. Downloading Dataset -

Data set is downloaded from Kaggle

2. Exploratory Data analysis (Dataset extraction and cleaning)

Removing all the duplicate data and empty values from the dataset

3. Data Pre- Processing and Modeling (Model and Feature selection / engineering)

Feature Extraction - Removing all categorical values and converting into numerical values .

4. Training Data

Training the model for predictions by diving the data set into training data and testing data

5. Testing and Evaluation (Validation)

The test is built to follow below guidelines, which we propose can be applied to approach for activity testing:

1.Accuracy loss matrix 2.F1 score 3.Precision

4.Sensitivity 5.Specificity **6.Visualization**

Visualizing he data in pictorial representation

7. Accuracy / metric calculations from predictions

Calculating the prediction accuracy and displaying

Objectives:

Signals provided by sensors are commonly used for activity recognition. Following that, the signals are preprocessed, segmented, characteristics extracted, and activity detected. The major goal of the Human Activity Recognition System is to investigate the constraints of selfsufficient people and to offer solutions to overcome them. One may simply monitor human activities and assess data collected by various wearable and non-wearable sensors.

Learning goal:

HAR's primary purpose is to detect frequent human actions in real-world contexts. Many data mining approaches, such as Decision Tree, Random Forest, AdaBoost, and Support Vector Machine, have been utilized to accurately forecast activities.

Features:

1.Seperating the data according to the categories

2.Deleting unnecessary data

3.Seperating training and testing data

4.Activity recognition like following

1.Walking 2.Walking Upstairs 3.Walking Downstairs

4.Sitting 5.Standing 6.Laying

5. Convolutional neural networks models

6.Long short-term memory networks

7. Supervised Learning Data Representation

Requirements:

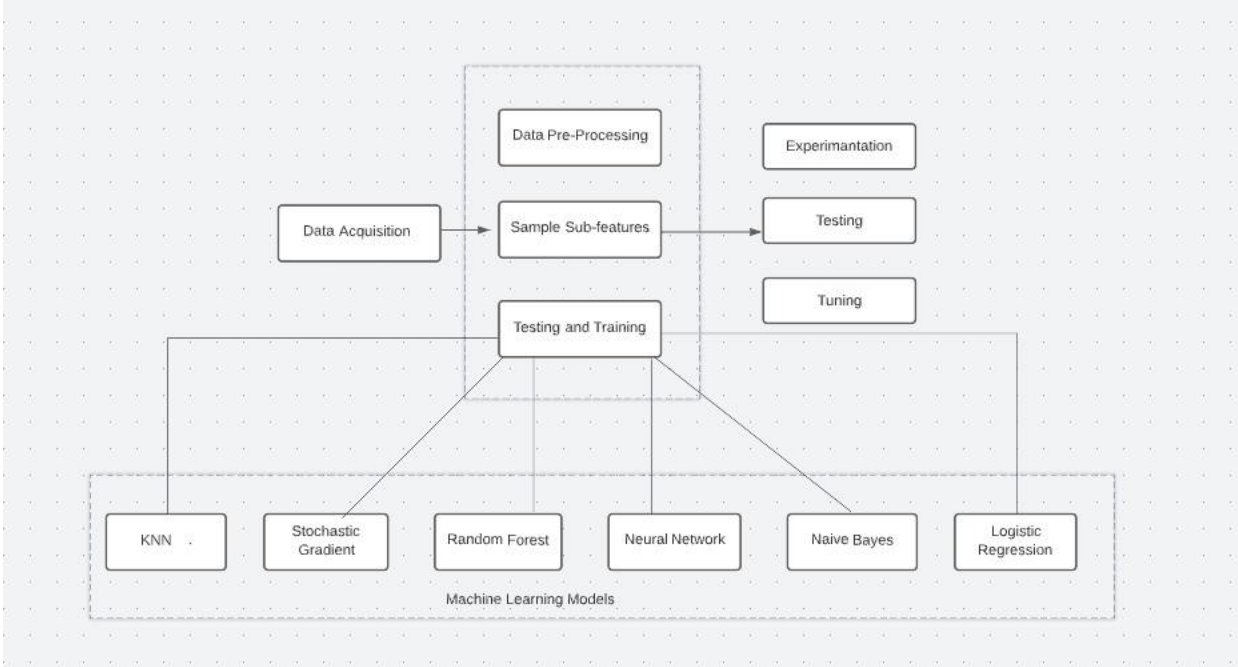
When it comes to detecting a person activity at any position, one of the most crucial requirements is a sensor data which is detected by neural network models. When the movement of human activity is detected, the data extracted and processed will generate the position of that human body. However, first a dataset must be scraped or created, and then preprocessing must be performed on that dataset. Once the data have been preprocessed, the data must be sorted into distinct movements or positions using different machine learning methods.

In terms of software and packages the following are required:

- Python 3.6 or above
- Pandas for creating dataframes and data analysis
- Numpy for n-dimensional array
- Seaborn for visualization
- Sklearn for ML libraries
- Keras for creating deep models
- Tensowflow
- Neural network models

Workflow :

Because the data represents a multivariate classification issue, we will employ both supervised and unsupervised learning techniques. A neural network written in Python will produce superior results. The dataset will be loaded into the Random Forest, kNN, Neural Network, Logistic Regression, Stochastic Gradient Descent, and Naive Bayes modules. Their Precision and Recall Values will be determined, and a Confusion Matrix for each model will be created. Figure shows the suggested system's architectural diagram.



Exploratory and Extensible:

The method of recognizing human activities is fairly similar to that of a general-purpose pattern recognition system and corresponds to a series of processes spanning from data collection through activity classification. This technique entails a series of modifications of raw data acquired from sensors in order to develop efficient classification models of human activities. The HAR methodology for smartphones equipped with inertial sensors may be separated into two approaches based on machine learning techniques: shallow algorithms (e.g., SVM, KNN, and decision tree) and deep algorithms (e.g., CNN, RNN, RBM,SAE, DFN, and DBM). The primary distinction between both techniques is whether the characteristics are retrieved manually or automatically.

In the case of data acquired from inertial sensors, characteristics are frequently retrieved based on two primary domain features: time domain and frequency domain [63]. The problem of this traditional technique is that, in some circumstances, human competence may not always be able to choose the appropriate combination of attributes for different scenarios. Another problem is that this strategy might yield irrelevant features, necessitating the use of methods that minimize the dimensionality of the data, such as feature selection, because superfluous features can affect the efficiency of the classification algorithm.

Evaluation Criteria:

The test is built to follow below guidelines, which we propose can be applied to approach for activity categorization testing:

1. Accuracy loss matrix
2. F1 score
3. Precision
4. Sensitivity
5. Specificity

References:

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2. https://www.ijitee.org/wp-content/uploads/papers/v8i12S/L110010812S19.pdf

3.https://www.researchgate.net/publication/339566682_Human_Activity_Recognition_using_Machine_Learning_Classification_Techniques