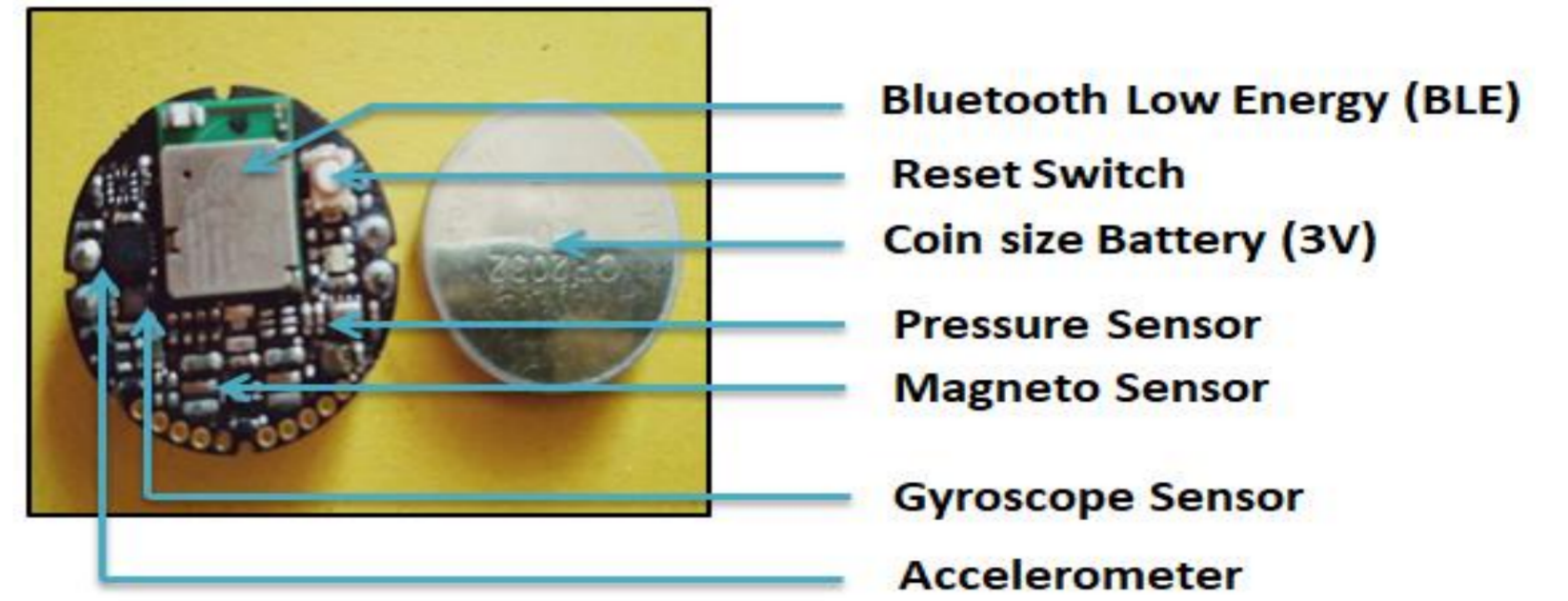


ACTIGRAPHY: ANALYZING HUMAN MOVEMENTS

Abstract

Actigraphy is a non-invasive method of monitoring human movements and activities. It refers to the use of sensors to measure and record activity, in the natural environment over extended time periods. Actigraphy devices come with an integrated sensor unit, having an accelerometer, gyroscope, magnetometer, pressure sensor etc. The device sends the raw data to a mobile application using an inbuilt BLE technology. The raw data from the device will normally have noise, and hence pre-processing techniques are used to remove the noise. Machine Learning Techniques are used for prediction of human movements and related actions.

Actigraphy Device Specifications



Methods – Analyzing Human Movement

- ❑ Advancements in **Nano wearable** technology provided miniature sized wearable devices with high-end features that enabled the effective integration of Actigraphy in various domains.
- ❑ Actigraphy devices have been used to measure movements of Chest, Arms, Hip, Waist, Knee and Ankle etc. These movements are analysed further to identify the associated activity.
- ❑ Data acquisition is done in a natural setup thereby permitting extensive data collection for extended period of time without the need for controlled clinical setup.
- ❑ Advancement in data science has helped in making accurate activity predictions from *the acquired movement data*, using Machine Learning and Deep Learning techniques.
- ❑ Human movement analyses has several applications ranging from critical to and everyday activities
 1. **General Healthcare applications** (sleep disorders, dementia patients etc.)
 2. **Injury prediction**
 3. **Clinical support (therapy)**
 4. **Fitness analysis**
 5. **Defence Applications (Security) and**
 6. **Sports- Analysis etc...**

Data Acquisition Process

The Actigraphy device transmits the data using an inbuilt BLE technology to the associated Mobile Application or System Application provided by the manufacturer. Data can be acquired either using an online or offline method.

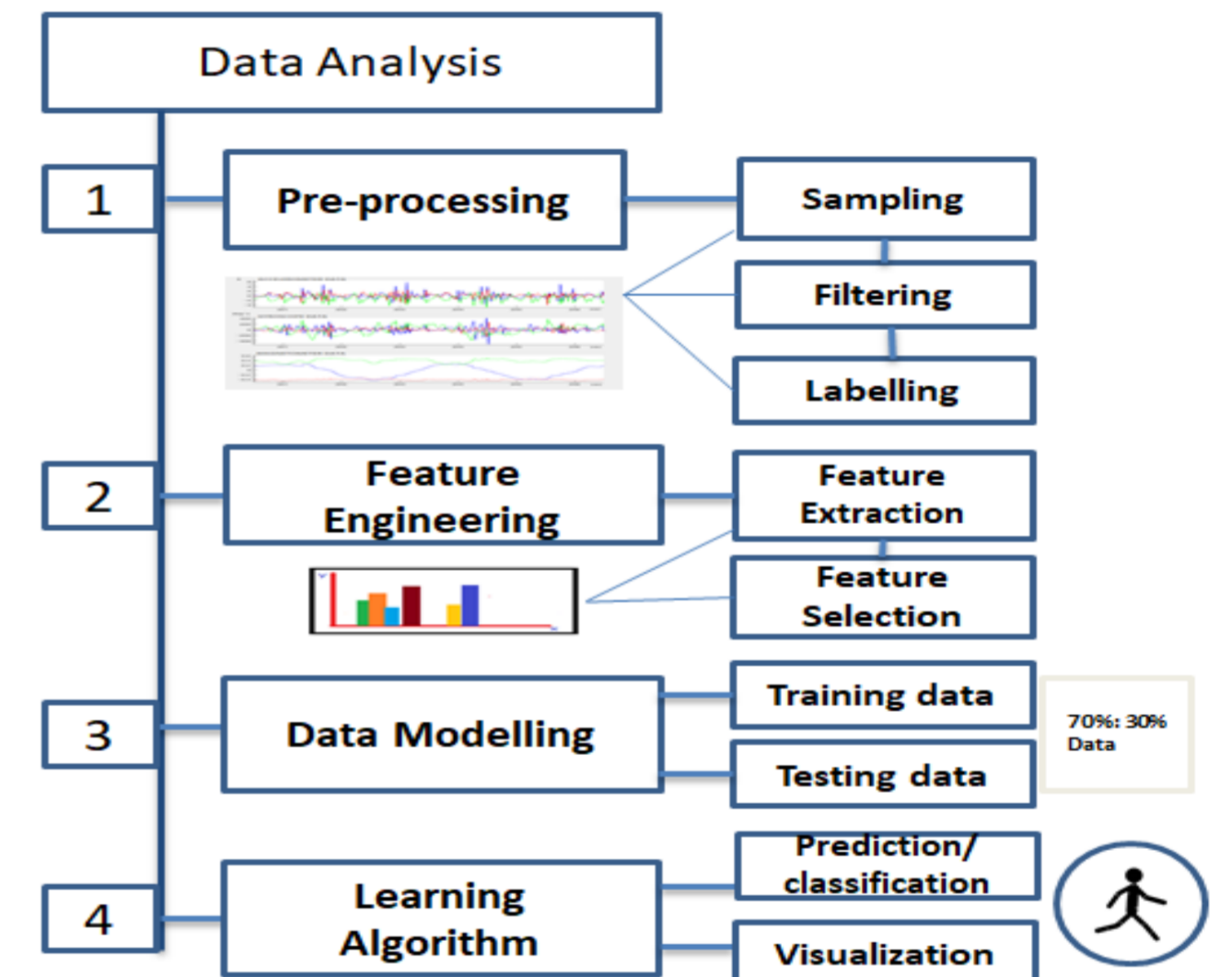
Online Process :

Live Data streaming for Mobile Application / PC Application.

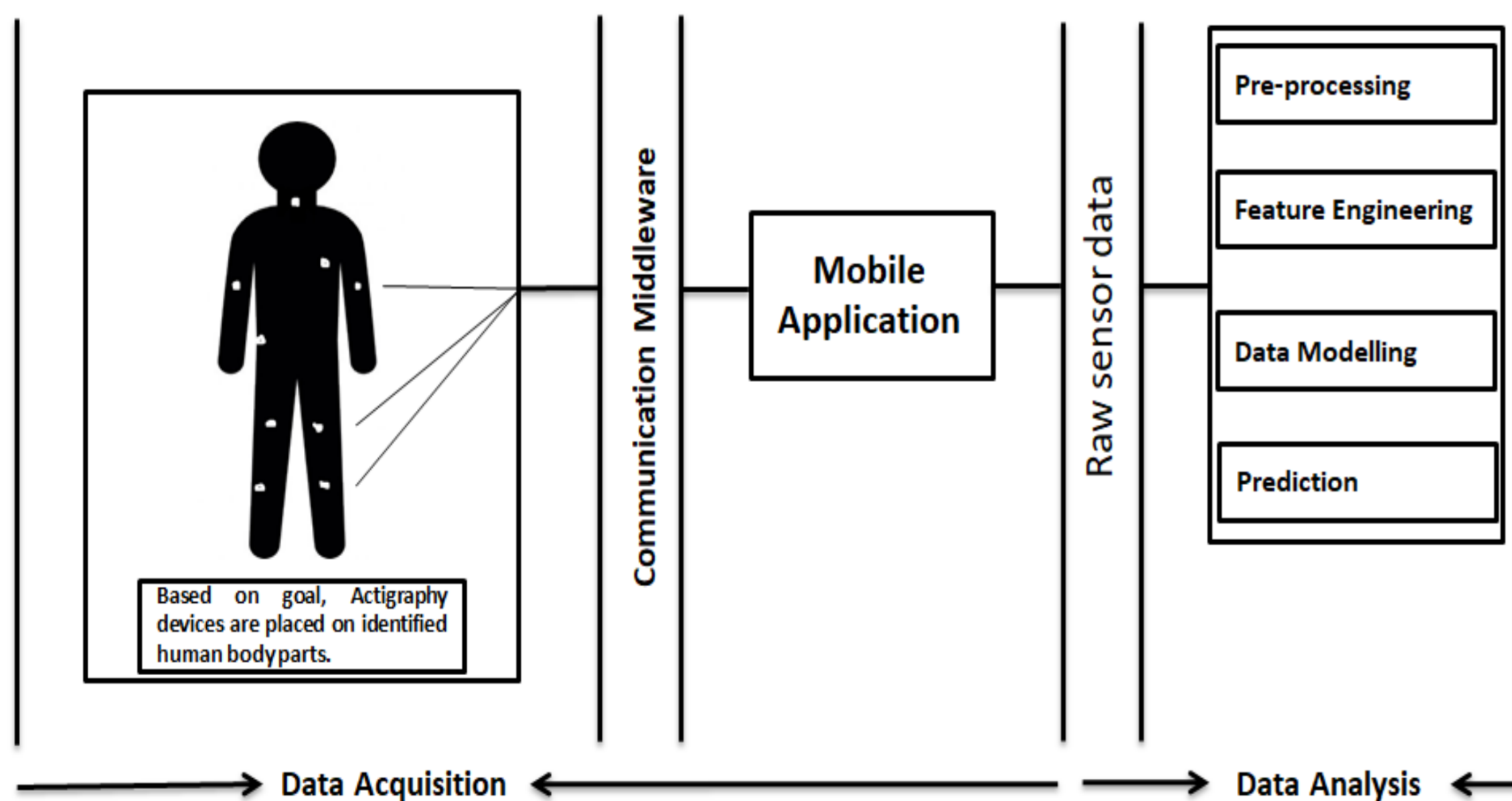
Offline Process:

Retrieve the data from the Device Memory Location or from the Cloud Application.

Data Analysis – Machine Learning Techniques

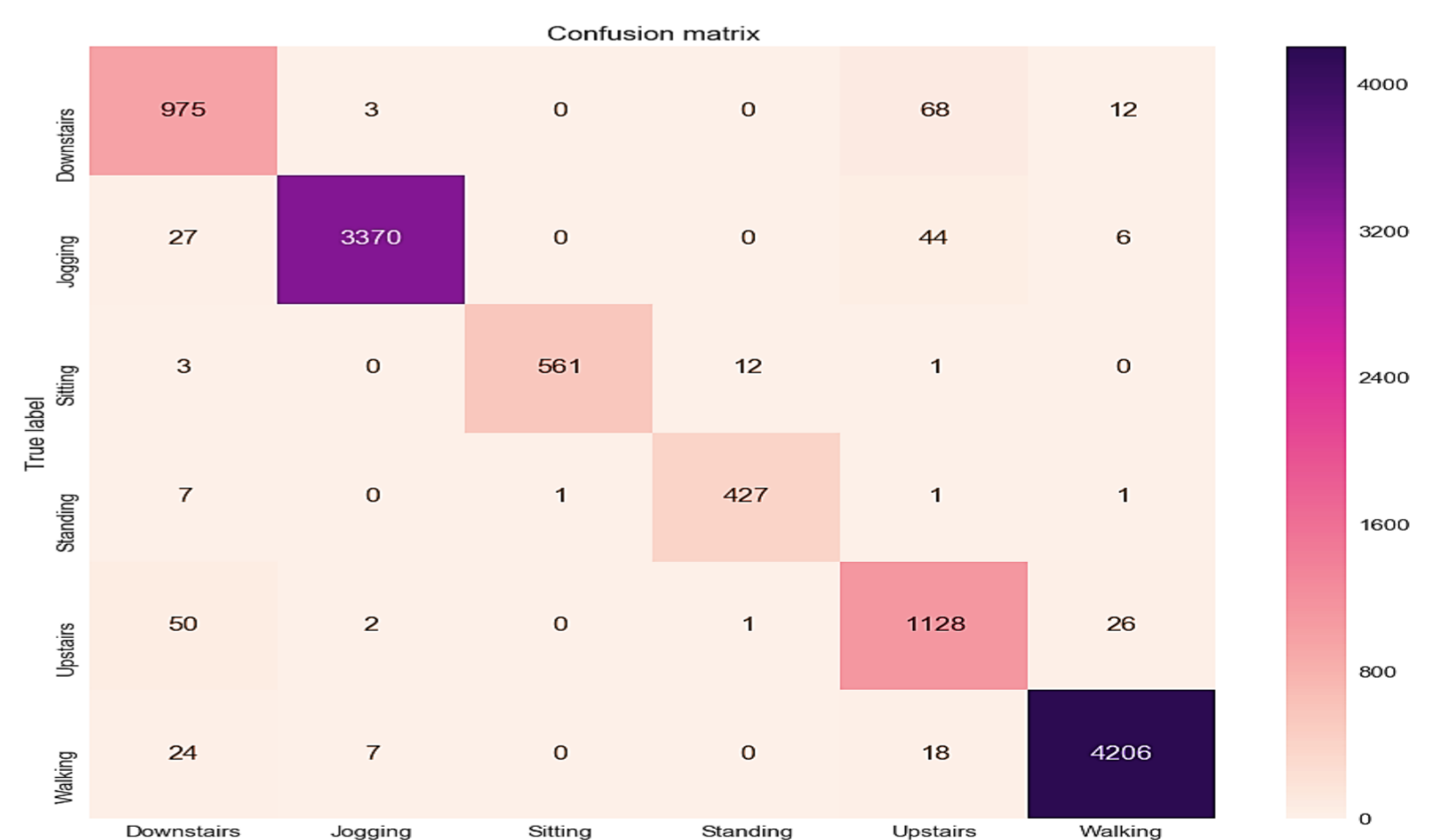


Block diagram - Human Movement Analysis



Functional representation of Human Movement Analysis using Actigraphy device and data science methods.

Prediction /Classification of Human Movements



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