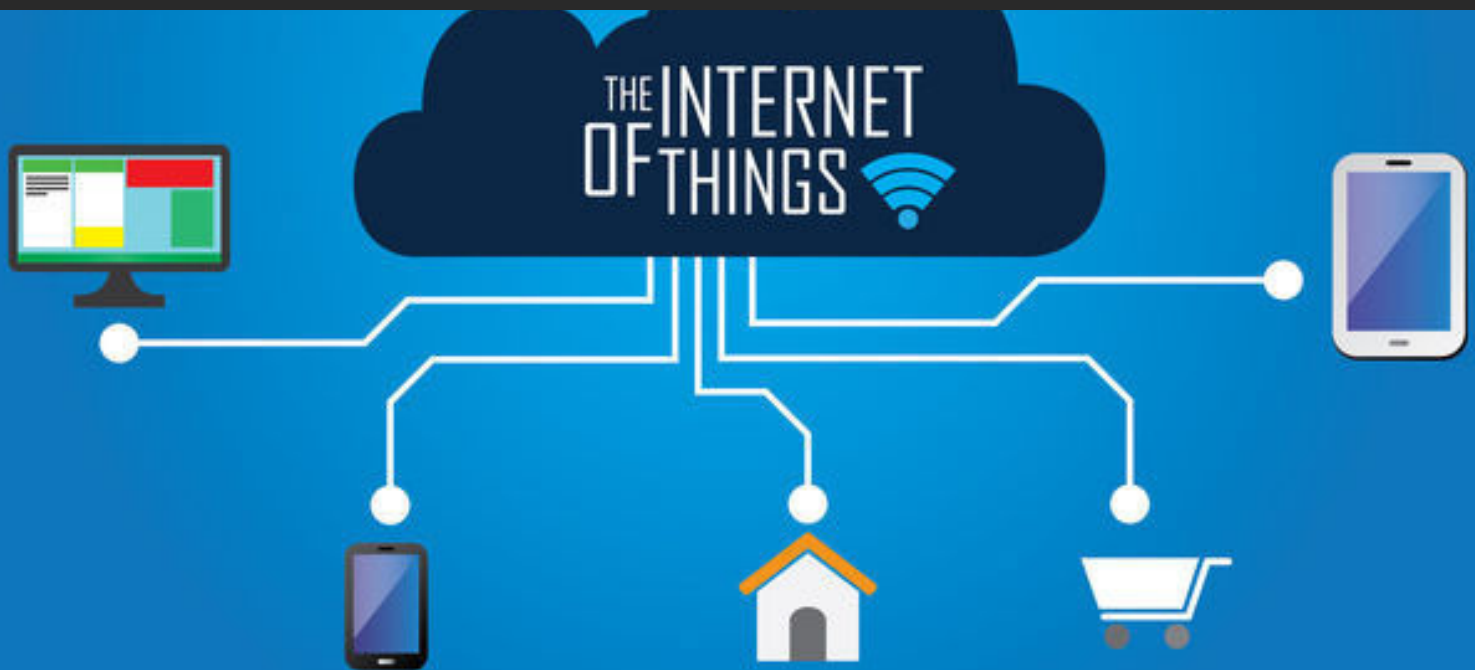# HUMAN ACTIVITY RECOGNITION

IMPORTANT DATES

LECTURES: 2ND April and 30th April

Submission of Assignment through VLE 22nd May Friday by 18:00

Demo 28th May

OBJECTIVE:

BY DR CONRAD ATTARD & MR JOE BONELLO

Human Activity Recognition using Body-Worn Sensors

The assignment is divided into two parts.

Part One: Design and implement a HAR strategy for a physical activity case study.

Part Two: Analyse using WEKA tool or tool of your choice.

Background

You are required to design, implement and analyse a controlled experiment with multiple human subjects. Identify a number of activities between 10 to 14, related to either one of the case studies 1) fitness or 2) common day to day activities that meet the following requirements.

Choose a device to create a dataset. You can work in groups. You can use a smart mobile device or wearable. Identify the dataset you need OR create your own dataset using a device of your choice.

> **1) CHOOSE AND DEPLOY APPROPRIATE SENSORS TO OBJECTS AND ENVIRONMENTS**
>
> **2) CREATE COMPUTATIONAL ACTIVITY MODELS**
>
> **3) COLLECT, MANAGE AND PROCESS PERCEIVED INFORMATION**
>
> **4) DESIGN AND DEVELOP REASONING ALGORITHMS**
>
> **5) CARRY OUT PATTERN RECOGNITION**

Requirements.

1) For PART 1 Design a controlled experiment that has a number of activities.
a. Choose a device that is suitable for your study and discuss the attributes that can be used for the proposed study.

b. Collect data using tri-axial data and/or location data

c. Describe the dataset depending on the output you wish to obtain and size.

d. Activities should include the following:
    i. Simple Activities
    ii. Interleaved Activities
    Iii. Concurrent Activities
    iv. Specific to the case study.

e. Discuss how your dataset has been created considering the various characteristics and choice of attributes depending on the device sensors window size and final objective achieved or not.
f. Create a model of your proposed solution.

2) For PART 2 Analyse raw data

a. Raw Data
    i. Identify the dataset you need OR
    ii. Create your own dataset using a device of your choice.

b. Analyse your dataset.
    i. Feature Extraction and Selection. You might consider engineering your own features and use them instead of/in conjunction with the features available in the dataset.
    ii. Create a training and testing dataset from the given dataset. You will need to explain how you chose these datasets and the strategy you have adopted to train your model.
    iii. Apply a Machine Learning technique using the WEKA machine learning toolkit or another tool of your choice. You will need to explain your choice for the algorithm you have chosen, including its suitability for the problem at hand.

Present a report discussing your results comparing at least 2 different machine learning algorithms discussing your choices and how you can improve your results.

References and Tools.

1] E. Kim, S. Helal, and D. Cook, "Human Activity Recognition and Pattern Discovery," IEEE pervasive computing / IEEE Computer Society [and] IEEE Communications Society, vol. 9, no. 1, p. 48, 2010.

[2] Andreas Bulling, Ulf Blanke, and Bernt Schiele. 2014. A tutorial on human activity recognition using body-worn inertial sensors. ACM Comput. Surv.46, 3, Article 33 (January 2014), 33 pages. DOI=http://dx.doi.org/10.1145/2499621