



Master in Artificial Intelligence (UPC-URV-UB)

Master's Thesis Proposal

General Information

Master's Thesis Title: *Action and gesture recognition using wearable devices and inertial sensor networks*

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Modality: **research work**

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Observations:

Student's Name:
(if already known)

M.Sc. Thesis Description

Brief Description: (a 4-5 lines long paragraph)

This Master Thesis is focused on wearable sensors, in particular inertial sensors and wearable computing. The main goal of this work is to analyse and develop strategies for gesture recognition using the information of several sensors located on user's body. In particular, we will analyse ways of segmenting groups of movements and classify them according to several patterns.

Detailed Description: (a half-page or one-page description, may include a brief task planning)

Wearability of computational resources and miniaturization of sensor units have enabled one of the most active and promising areas in machine learning and pattern recognition, that is human behavior analysis and activity recognition. There is a large body of literature addressing specific parts of the human behavior analysis problem. But few effort has been made in understanding human behavior as a complete hierarchy of movements, actions and activities. And even less effort has been made with respect to analyzing these data in the wild. In this work we focus on effective strategies for motion segmentation and representation with the aim of characterizing individual actions. Elastic matching techniques will be used for putting into correspondence actions from different people. As a result, a demonstrator will be built, consisting in a "personal trainer" that quantifies and gives feedback to the user according to how well a certain activity is being performed.

Planning:

- (A) Analysis of the problem of gesture recognition from inertial data.
- (B) Formulation of the new proposal from the point of view of ensemble learning.
- (C) Creation of a dataset of complex gestures from several sensors.
- (D) Validation of the proposal.

References: (bibliographical references, relevant web links, etc.)

Nuria Oliver, Eric Horvitz & Ashutosh Garg, 'Layered Representations for Human Activity Recognition'. ICMI 2002

J Barbič, A Safonova, JY Pan, C Faloutsos, Segmenting motion capture data into distinct behaviors. Int. Conf. Graphics Interface, 2004

C Sminchisescu, A Kanaujia, D Metaxas, Conditional models for contextual human motion recognition, Computer Vision and Image Understanding, 2006

J. Lester, T. Choudhury et al. A hybrid discriminative/generative approach for modeling human activities IJCAI 2005

C. Nicolini, B. Lepri, S. Teso and A. Passerini, On-Going to Complete Activity Recognition Exploiting Related Activities, Human Behavior Understanding, 2010.

T. Duong et al. Efficient duration and hierarchical modeling for human activity recognition Artificial Intelligence, 2009

Location and Date: Barcelona,

To the Academic Commission of the Master in Artificial Intelligence (CAIMIA)