Research project for a PhD curriculum in ICT – Computer Engineering and Science

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**(\*\*) Foreign Co-tutor:  
Proposed Title of the research:** *Action Recognition to estimate Activities of Daily Living (ADL) of elderly people*

**Keywords: (5):** Action recognition; Prediction models; Transfer learning; CNN; Video dataset; healthy-aging

**Research objectives: --(max 10 rows)**

The rising aging of population and overstretched healthcare resources are increasingly pushing the adoption of technologies (World Health Organization (WHO) recommendation to support independent living and improve the quality of life at home.

In the last few years Smart Home concept emerged as a viable mainstream approach to achieve this goal. A Smart Home system is a residential home setting augmented with a diversity of multimodal sensors, actuators, and devices along with Information and Communication Technologies (ICT) -based services and systems. By monitoring environmental changes and inhabitant's activities, an assistive system in a Smart Home can process perceived sensor data, make timely decisions, and take appropriate actions to assist an inhabitant perform Activities of Daily Living (ADL), thus extending the period of time living independently within their own home environment. The problem is inherently multi-modal and it provides a great baseline to apply Artificial Intelligence (AI) methods.

The main research objective of this PHD curriculum is to explore the ADL recognition problem by focusing on video-based analysis.

**Proposed research activity -- (max 10 rows)**

* Study of the state of the art projects in this area
* Creation of neural network models, in particular CNN, trained on data extracted and pre-processed from ADL video datasets
* Study and test of predictive models to support compilation of the Multidimensional Prognostic Index (MPI) about an elderly person that lives in his/her residential context.
* "Classification task: from multi-class to multi-label"
* Identification and classification of the action related to the person in the scene; Anonymization of the video to solve problems related to Privacy
* Creation of a model for the estimation of ADL the components: spatial, temporal and audio
* NLP application for compiling the Short Portable Mental Status Questionnaire (SPMSQ)

**Supporting research projects (and Department)**

The project will use data from the "Moments in Time" dataset, a resource released by MIT-IBM Watson AI Lab that includes a collection of one million labeled 3 second videos from hundreds of categories.

**Possible connections with research groups, companies, universities.**IBM Watson AI Lab, IBM Italia