

# Master thesis proposal Summer Semester 2018

Title: **Recognition of human activities from a mix reality system**

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## Description

With the recent advancements in sensory technologies, perceiving reliably basic human actions have become tenable. If robots were to learn or interact with humans in a meaningful manner, the next foreseeable challenge to face robotic research in this area is toward the semantic understanding of human activities - enabling them to extract and determine higher level understanding [1,2]. Allowing robots to recognize activities through different sensors and re-using its previous experiences is a prominent way to program robots [1,3]. For this, a recognition method needs to be proposed such that is transferable toward different domains independently of the used input sources, for example, the augmented reality systems.

## Objectives

The Microsoft HoloLens<sup>1</sup> is the first self-contained, holographic computer, enabling you to engage with your digital content and interact with holograms in the world around you. It embraces virtual reality and augmented reality to create a new reality known as a mixed reality. This sensor will enrich the perception of human behaviors and it is expected to enhance the extraction of semantic representation of human everyday activities. The goal of this internship is to build a gesture recognition system using the HoloLens as main communication platform with the user while tracking his/her movements using the Perception Neuron<sup>2</sup> suit or other wearable devices (e.g. smart watch). Based on the recognized activity the developed system should predict the next activity and give recommendations accordingly. For example, the user is picking a glass from the dishwasher, the developed system should give recommendations on the locations of where place the glass, either a cupboard (to save the item) or the fridge (to pour some cola).

## Required skills:

The internship requires a strong knowledge of:

- C++
- ROS (Robot Operating System).
- Prolog and understanding of First Order Logic (FOL)

## References:

[1] Karinne Ramirez-Amaro, Michael Beetz, Gordon Cheng: Transferring Skills to Humanoid Robots by Extracting Semantic Representations from Observations of Human Activities. Artificial Intelligence Journal, 2015.

[2] Karinne Ramirez-Amaro , Michael Beetz and Gordon Cheng: Understanding the intention of human activities through semantic perception: observation, understanding and execution on a humanoid robot. Advanced Robotics 29 (5), 2015, 345-362.

[3] E. Dean, K. Ramirez-Amaro, F. Bergner, I. Dianov, P. Lanillos, and G. Cheng: Robotic technologies for fast deployment of industrial robot systems. IEEE Industrial Electronics Conference (IEEE IECON2016), 2016.

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1 <https://www.microsoft.com/microsoft-hololens/en-us>

2 <https://neuronmocap.com/>