Title (tentative): Sensorimotor Representations for Human Grasping

Thesis advisor(s): Chessa Manuela, Fabio Solari, Guido Maiello (Department of Experimental Psychology, Justus-Liebig University Gießen, Germany)

E-mail: Manuela.Chessa@unige.it

Address: Via Dodecaneso, 35
        stanza 226 329

Phone: (+39) 010353 - 6663

Description

Motivation and application domain

The apparent ease with which we grasp objects every day masks the complexity of neural computations underlying human grasp planning. The planning of stable grasps is also a highly active and largely unsolved topic in robotics research. The proposed thesis project will focus on developing fundamental tools to understand how humans and machines may plan and execute grasps to manipulate arbitrary objects.

General objectives and main activities

Humans can plan a grasping movement by simply looking at an object. How does our brain go from the visual input at the retinae to the motor signals necessary to execute a precise hand movement such as a grasp? The thesis project will focus on trying to learn the mappings between image features and grasp configurations using novel and powerful machine learning tools in the form of Deep Neural Nets (DNNs). The neural nets will take as input binocular images of rendered scenes containing objects to be grasped. The output of the DNNs will encode the 3D position of the hand and fingers selected to grasp the object. The analysis of the sensorimotor representations learned by the network will lay the ground work for a data- and theory-driven approach to understand human grasping and translate human grasping behavior onto anthropometric robotics platforms.

Training Objectives (technical/analytical tools, experimental methodologies)

The student will learn to create, train and analyze new and powerful artificial intelligence systems using deep learning software such as TensorFlow and the Matlab Neural Network Toolbox.

Place(s) where the thesis work will be carried out: DIBRIS - Valletta Puggia Via Dodecaneso 35

Additional information

Maximum number of students: 2