Applications for the first 2024 call are now OPEN

Research Themes 2024: Curriculum Cognitive Robotics, Interaction and Rehabilitation

In the spirit of the doctoral School on Bioengineering and Robotics the PhD Program for the curriculum **"Cognitive Robotics, Interaction and Rehabilitation Technologies"** provides interdisciplinary training at the interface between technology and life-sciences. The general objective of the program is to form scientists and research technologists capable of working in **multidisciplinary teams** on projects where **human factors** play a crucial role in technological development and design. Interested applicants are encouraged to contact the perspective tutors for clarifications before submitting their application. The ideal candidates are students with a higher-level university degree willing to invest extra time and effort in blending into a multidisciplinary team composed of neuroscientists, engineers, psychologists, physicists working together to investigate brain functions and realize intelligent machines, rehabilitation protocols and advanced prosthesis.

PhD Position in Adaptation in Cognitive Architectures for Human Robot Interaction @ Italian Institute of Technology (IIT)

In the spirit of the doctoral School on Bioengineering and Robotics (https://biorob.phd.unige.it/how-to-apply), the PhD Program for the curriculum "Cognitive Robotics, Interaction and Rehabilitation Technologies" provides interdisciplinary training at the interface between technology and life-sciences. The *CONTACT* Research Line is coordinated by *Alessandra Sciutti*, who has extensive experience in *Cognitive Architecture for Human Robot Interaction*.

Description: To live independently, to interact with others and with daily life environments humans rely on their ability to adapt and to tune body and mind to contingent situations and goals. In humans, adaptation manifests both as a conscious change in our behaviors to adapt to changing environmental and social conditions and as an automatic regulation of chemically-mediated bodily reactions to external stimuli (or to maintain homeostatic conditions). Adaptability thus represents one of the desiderata for a cognitive agent, enabling it to fit in easily in changing environmental conditions and providing the foundation for rich, human-like personalized interaction with other agents. The candidate interested in this research project will investigate the cognitive bases of human adaptation abilities by designing, implementing and testing elements of a cognitive architecture for an artificial cognitive agent, such as the iCub humanoid platform. This Ph.D. project advances the topics of the iCog Cognitive Architecture scientific initiative (https://www.icog.eu/scope), at the convergence of many relevant disciplines, such as computer science, artificial intelligence, neuro- & cognitive sciences, robotics, and social sciences. The successful candidate will collaborate with an international network of researchers and partake to the sharing and convergence of multidisciplinary knowledge.
Requirements: Degree in Robotics, Bioengineering, Computer science, Computer engineering, Cognitive Sciences or related disciplines; attitude for problem-solving; C++ programming skills preferable (but not mandatory for candidates from non-CS backgrounds).

Contacts: Applicants are strongly encouraged to contact the prospective tutors before they submit their application: Francesco.Rea@iit.it, Alessandra.Sciutti@iit.it, Giulio.Sandini@iit.it

PhD Position in Cognitive-inspired architectural approach for AI in human-robot interaction @ Italian Institute of Technology (IIT)

In the spirit of the doctoral School on Bioengineering and Robotics (https://biorob.phd.unige.it/how-to-apply), the PhD Program for the curriculum "Cognitive Robotics, Interaction and Rehabilitation Technologies" provides interdisciplinary training at the interface between technology and life-sciences. The *CONTACT* Research Line is coordinated by *Alessandra Sciutti*, who has extensive experience in *Cognitive Architecture for Human Robot Interaction*.

Description: Cognitive-based computer vision refers to models that can achieve the classical computer vision functionalities — detection, localization, recognition, and understanding — with goal-directed behaviour, the ability to adapt to unforeseen changes in the environment and anticipate the presence of objects and the occurrence of events and actions. The integration of vision with multisensory information (including auditory, haptic and tactile perception) and a proactive approach to the acquisition of novel experiences supported by a cognitive architecture, endows a cognitive robot with the awareness of the physical and social environment. The multisensory and sensory-motor integration necessary to this aim can benefit from AI components that improve the capability of the artificial intelligent system to understand and interact with the world and others. The general goal of this project will be to develop the AI components of a cognitive architecture (such as action generation, memory, internal motivation, perception) endowing the humanoid robot iCub with the ability to interact with human partners, with a focus on multisensory perception for action understanding in dyadic or small groups interactions. Using machine learning techniques, the student will start from existing computational models in order to enable a robot to decode the interaction partners' action, intention, or internal states (mood or feeling) and to generate appropriate behaviours. The successful candidate will collaborate with an international network of researchers and partake to the sharing and convergence of multidisciplinary knowledge.

Requirements: Degree in robotics, bioengineering, computer science, computer engineering, or related disciplines, attitude toward problem-solving, basic skills in C++ programming. A background in computer vision and machine learning is a relevant asset

Contacts: Applicants are strongly encouraged to contact the prospective tutors before they submit their application: Francesco.Rea@iit.it, Alessandra.Sciutti@iit.it, Giulio.Sandini@iit.it

PhD Position in Affective communication in human robot interaction: behavioral and
neural perspectives @ Italian Institute of Technology (IIT)

In the spirit of the doctoral School on Bioengineering and Robotics (https://biorob.phd.unige.it/how-to-apply), the PhD Program for the curriculum "Cognitive Robotics, Interaction and Rehabilitation Technologies" provides interdisciplinary training at the interface between technology and life-sciences. The *CONTACT* Research Line is coordinated by *Alessandra Sciutti*, who has extensive experience in *Cognitive Architecture for Human Robot Interaction*.

Description: During social interactions, the observation of actions allows us to understand the attitudes of others. Humans perform actions with different forms expressing their positive or negative mood/internal state. For example, observing a person that greets us, we may understand if that person is happy or not, or if he/she feels good or not. The perception and the generation of these forms of communication could be a valuable property for future robots allowing them to assume the right attitude in different scenarios, such as an authoritative role in the security contexts or a polite behavior in clinical ones, influencing human behavior. The aim of the present project is to study the kinematic features characterizing different human actions performed with different forms (i.e., gentle, enthusiastic, annoyed, rude) and to enable the iCub humanoid robot to express them with its own behaviour and detect them from visual observation of human actions. To quantitatively evaluate the impact on humans from behavioral and neural point of view, the project will leverage Real Time functional Magnetic Resonance Imaging technique (fMRI). Several robotic actions will be presented to healthy participants in order to study, in real time, the neural activity involved in the processing of these robotic actions. The research project will be carried out in collaboration with the University of Parma that is equipped with an advanced 3 Tesla MR scanner endowed with Real Time fMRI technology. The work will take advantage of an existing software module available on the iCub robot supporting the generation and detection of actions with different properties and will potentially improve it. The successful candidate will: 1) participate in the generation of iCub robot's actions characterized by different kinematic features and forms; 2) participate in the development of algorithms to detect action forms; 3) develop and test cognitive paradigms coupled with cortical and subcortical Real Time fMRI recordings; 4) compute brain activity maps from fMRI data.

Requirements: Degree in Bioengineering, Computer Science, Computer Engineering, Robotics, or related disciplines, attitude for problem solving, C++ programming. We expect the candidate to develop skills in signal processing, and computational modelling. Excellent analytical skills (MATLAB) will also be required.

Contacts: Applicants are strongly encouraged to contact the prospective tutors before they submit their application: giuseppe.dicesare@iit.it, radoslaw.niewiadomski@dibris.unige.it , alessandra.sciutti@iit.it

Application's deadline: *The 2024 Doctorate First Call will close on July 9th 2024 at 12 noon (CET)*

Application Procedure

The 2024 Doctorate First Call will close on July 9th 2024 at 12 noon (italian time). FOR MORE DETAILS VISIT THE PHD WEBSITE OF OUR UNIVERSITY: https://unige.it/en/students/phd-programmes