PhD Program in Bioengineering and Robotics

Curriculum: Cognitive Robotics, Interaction and Rehabilitation Technologies

Research themes

ERC MySpace Position – Cortical mechanisms of spatial representation in children with and without visual impairment

From science to technology for visually impaired children

Human-artificial interaction systems, machine learning and tools development

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.
ERC MySpace Position – Cortical mechanisms of spatial representation in children with and without visual impairment

**Tutor:** Monica Gori

**Tutors Affiliation:** Istituto Italiano di Tecnologia (IIT), Research Unit: Unit for Visually Impaired People (https://www.iit.it/it/linee/unit-for-visually-impaired-people)

**Project Description**

The human brain is highly plastic, able to modify its structure and functions to adapt to changes within the body or in the external environment. How spatial representation develops still needs to be determined. We have recently demonstrated that blind children have problems with much audio-spatial processing. The goal of this Ph.D. theme are:

- studying spatial development from infancy to childhood.
- studying the development of spatial representations with EEG technique.
- studying the relationship between spatial processing and sensory-motor skills.

The work of the Ph.D. will be within the ERC MySpace project (www.MySpaceproject.eu).

**Requirements**

The Ph.D. student will be involved in doing psychophysical and EEG experiments with infants and children. A background in experimental psychology, EEG techniques and cognitive neuroscience are required.

**References:** -

**Contacts:** Applicants are strongly encouraged to contact the tutor before they submit their application: monica.gori@iit.it.
From science to technology for visually impaired children

Tutor: Monica Gori

Tutor Affiliation: Istituto Italiano di Tecnologia (IIT), Research Unit: Unit for Visually Impaired People (https://www.iit.it/it/linee/unit-for-visually-impaired-people)

Project Description
The project aims to understand the perceptual and motor abilities of children with visual impairment to develop and validate new multisensory technology for rehabilitation. Unit for Visually Impaired People (IIT), in collaboration with Gaslini Hospital (IRCCS, Genova), is looking for a PhD in multisensory development in young children and adults with visual disability.

The goal of the project is to understand brain principles and develop technologies to support the inclusion based on sports activities of children with motor disabilities through:

- The study of motor and perceptual abilities of motor-impaired children.
- The technology's demonstration and validation through user, experimental and clinical studies.

Requirements:
The PhD student will be involved in doing psychophysical and motor tracking experiments with children and help develop and validate the device from the electronic and software point of view. A background in fundamental neuroscience, motion tracking analysis and programming skills are required.

References: -

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Human-artificial interaction systems, machine learning and tools development

Tutor: Monica Gori

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Project Description

The research focuses on the quantitative characterization of individuals to develop and validate user-centered urban technologies for inclusive engagement.

The candidate will work in a challenging and international environment using science to develop new technological solutions with a concrete impact on society.

Specifically, the goal of the Ph.D. project is to investigate the mechanisms underpinning individual variability in developing new methods and technology for personalized inclusion.

The Ph.D. student will design experiments applying statistics and machine learning approaches (in particular, supervised learning, learning with partial feedback, and reinforcement learning) to quantify the subject’s characteristics and will develop new applications/technological solutions to extract the information of interest.

Requirements

An M.Sc. in artificial intelligence, computer science, computer engineering, robotic engineering, biomedical engineering, or related fields.

Knowledge of Python (strongly preferred for machine learning), R, and MATLAB environments.

References: -

Contacts: Applicants are strongly encouraged to contact the tutor before they submit their application: monica.gori@iit.it.