



PhD in BIOINGEGNERIA / BIOENGINEERING - 39th cycle

THEMATIC Research Field: MACHINE LEARNING FOR HUMAN-ROBOT COLLABORATION | APPRENDIMENTO AUTOMATICO PER COLLABORAZIONE UOMO-ROBOT

Monthly net income of PhDscholarship (max 36 months)
€ 1400.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>In the current industrial context, the importance of assessing and improving workers' health conditions is widely recognised. Both physical and psycho-social factors contribute to jeopardising the underlying comfort and well-being, boosting the occurrence of diseases and injuries, and affecting their quality of life. Besides the harmful effects on workers themselves, physical and mental health problems may lead to impressive costs to enterprises and society, being one of the most common causes of disability, sick leave and early retirement. Human-robot collaboration (HRC) frameworks stand out among the possible solutions to prevent and mitigate workplace risk factors. The increasingly advanced control strategies and planning schemes featured by collaborative robots (Cobots) have the potential to foster fruitful and efficient coordination during the execution of hybrid tasks, by meeting their human counterparts' needs and limits. However, due to varying body characteristics, work style, personal experience, task complexity, etc. people may react differently to workload and may need different interaction parameters during HRC. To foster human well-being and trust in Cobots, learning personalized human state models and robot movements that align with individual preferences are crucial. This PhD theme aims to create a semi-supervised learning approach that enables real-time Cobot adaptation to human psycho-physical state and preferences. Personalised models will be developed to estimate the workload and mitigate the</p>



	associated risks and to learn the preferred interaction parameters on the fly. The successful candidates will have access to several fixed and mobile base robotic platforms already present in the lab, and several sensory systems for measuring and predicting human behaviour.
Methods and techniques that will be developed and used to carry out the research	Research activities foresees extensive in lab experimentation at the Human Robot Interfaces and Interaction (HRI ² _ hri.iit.it) of the Istituto Italiano di Tecnologia, Genova
Educational objectives	<ul style="list-style-type: none"> - To learn scientific research methods in artificial intelligence, robotics and bioengineering - To learn team working - To improve scientific dissemination skills
Job opportunities	<ul style="list-style-type: none"> - Robotic and automation companies - Clinical centres for rehabilitation - Universities and research centres
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 0 PhD Students
Name of the research directors	Proff. Arash Ajoudani - Elena De Momi

Contacts	
<p><i>Arash Ajoudani (IIT)</i> <i>arash.ajoudani@iit.it</i></p> <p><i>Elena de Momi (POLIMI)</i> <i>elena.demomi@polimi.it</i></p>	

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6



Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

IIT will provide a desk, a personal laptop and if necessary a desktop PC to the candidate during the whole PhD period