

# Politecnico di Milano

## PhD in Bioengineering

**Research Title: “Dynamics-Aware Human Models for Ergonomic Human-Robot Collaboration| Sviluppo di Modelli Dinamici dell’uomo per la collaborazione ergonomica uomo-robot”**

<b>Scholarships and Financial support</b>	
Monthly net income of PhD scholarship (max 36 months)	€. 1.250/mensili (In case of a change of the welfare rates during the three-year period, the amount could be slightly modified)
Number of scholarships	1
Beginning of PhD	May 2 <sup>st</sup> 2021
Deadline for application	March 8 <sup>th</sup> 2021
<b>Context of the research activity</b>	
Motivations and objectives of the research in this field	Musculoskeletal disorders are the single largest category of work-related diseases in many industrial countries, and are associated with very large costs in lost productivity and absenteeism due to sickness. In high-volume production facilities, large parts of the workstation should ideally be adapted to the workers to prevent such injuries. However, in smaller production lines, especially found in small and medium enterprises, the regular adaptation of the entire workstation due to the high flexibility needs is a major challenge. A solution to the problem is the development of reconfigurable human-robot collaboration (HRC) workstations and frameworks. These are key to enable agile manufacturing by merging human dexterity, flexibility and problem-solving ability with robotics strength and precision. In this direction, This PhD theme aims to

	<p>create a framework that enables real-time adaptation to human dynamic factors and intentions. The focus will be on the development of real-time human dynamic models to track dynamic states and human ergonomic factors. Consequently, robot responses will be formed to assist the worker to perform the intended tasks in configurations in which the risks of injuries are minimum.</p> <p>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.</p>
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 Physical Interaction (HRI <sup>2</sup> – <a href="http://hri.iit.it">hri.iit.it</a> ) of the Istituto Italiano di Tecnologia, Genova
Educational objectives	<ul style="list-style-type: none"> <li>- To learn scientific research methods in bioengineering, robotics and artificial intelligence</li> <li>- To learn team working</li> <li>- To improve scientific dissemination skills</li> </ul>
Job opportunities	<ul style="list-style-type: none"> <li>- Robotic and automation companies</li> <li>- Clinical centres for rehabilitation</li> <li>- Universities and research centres</li> </ul>
Composition of the research group	<ul style="list-style-type: none"> <li>- POLIMI: 1 Full Professor, 2 Associated Professors, 2 Assistant Professors <a href="http://www.nearlab.polimi.it">www.nearlab.polimi.it</a></li> <li>- HRI<sup>2</sup> Laboratory: <a href="https://hri.iit.it/">https://hri.iit.it/</a></li> </ul>
Names of the research directors	<i>Arash Ajoudani (IIT)</i> <i>Elena de Momi (POLIMI)</i>
Contacts	<a href="mailto:arash.ajoudani@iit.it">arash.ajoudani@iit.it</a> <a href="mailto:elena.demomi@polimi.it">elena.demomi@polimi.it</a>
<b>Additional support</b>	
<u>Housing:</u> financial aid per PhD student per year (gross amount)	<p><u>Foreign students*</u> <i>inserire solo se rilevante</i></p> <p>1<sup>st</sup> year: ....euros per student 2<sup>nd</sup> year..... euros per student 3<sup>rd</sup> year: ....euros per student</p> <p>(max number of financial aids available...., given in order of merit)</p> <p><u>Out-of-town residents (more than 80 Km out of Milano)</u></p> <p>1<sup>st</sup> year: ...euros per student 2<sup>nd</sup> year: ...euros per student 3<sup>rd</sup> year: ... euros per student</p> <p>(max number of financial aids available...., given in order of merit)</p>
<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other informations</b>	

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