

# MANAGEMENT, PRODUCTION AND DESIGN

## Eng-Ind 4.0

<b>Funded By</b>	Dipartimento DIGEP FONDAZIONE CRT CASSA DI RISPARMIO DI TORINO [Piva/CF:06655250014]
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<b>Context of the research activity</b>	AUGMENTED HUMAN: Engineering methods and tools for Internet of Ability (IoA) in Industry 4.0
	<p>As part of Industry 4.0, the most innovative production systems have been increasingly including flexible, integrated, and smart configurations to support the cooperative manufacturing by adopting the latest advancement on the Internet of Things domain, such as Internet of Service (IoS) and Internet of Ability (IoA).</p> <p>In this sense, in order to add value to the smart industry strategies and supporting the Human-Centered Industry paradigm, the introduction of technologies oriented to enable collaboration, such as motion detection sensors, haptic devices, Virtual/Augmented Reality (VR/AR) tools and algorithms based on deep learning, makes it possible to create Internet-Based Systems, able to foster an inclusive industry and facilitate the Human-Computer Interaction (HCI) and cooperation during the execution of complex tasks (maintenance, tooling, inspection).</p> <p>Within this scenario, which aims to place the human at the center of the</p>

## Objectives

process, collaborative robots open new possibilities for the industry with humans and robots working side by side. The robot, one of the nine pillars of Industry 4.0, combined with an HCI-conscious collaboration logic, is an essential element to relieve the operators from repetitive and costly tasks and allow them to contribute to higher added value activities.

By focusing on higher-profile tasks, therefore managing the complexity and flexibility of the processes, and interacting with the robot in a collaborative environment, the operator's role changes and evolves to take advantage of the many unique cognitive skills that humans bring to the production environment, including creative and holistic thinking, analytical and problem-solving capabilities, difficult to imitate by the machines, especially in unexpected situations. In this perspective, according to the Augmented Human notion, the user and the machine become complementary, acting as a bridge that enables businesses to combine the best of both worlds.

To assist this change of perspective, it is necessary to adopt innovative solutions capable of supporting the user in the acquisition of these new abilities, also through alternative methods (offline, remotely) suited to encourage the transfer of practical operational skills.

Within this perspective, this research proposes the development of an Internet of Ability (IoA) framework which, through the integration of VR/AR solutions, deep learning and gesture tracking, supports an advanced and conscious interaction between human and robot.

To this end, behavioral analysis techniques will be adopted to study human behavior and improve human-machine integration. The use of VR/AR will allow recreating the industrial environment despite physical boundaries, such as distance or environmental danger, and guarantee remote support. For instance, production specialists would be able to perform operations and support other operators in performing assembly, inspection, or maintenance processes on the other side of the world.

The involvement of the senses, based on kinesthetic and tactile learning, for example through the use of haptic gloves, will allow a tangible physical interaction and a deeper skills acquisition, as demonstrated by recent studies on the effectiveness of live learning and the benefits of the learn by doing.

## Skills and

The candidate should have a degree in the area of Industrial Engineering, with competences and interests regarding process mapping, human machine interaction, Augmented/Virtual Reality and computer-aided design

**competencies  
for the  
development of  
the activity**

tools and simulations. The candidate should have good English communication and writing skills and be willing to work in our laboratory on 3D tools and methods for engineering (3D Lab) where the experiments take place.