



PhD in ARCHITETTURA, INGEGNERIA DELLE COSTRUZIONI E AMBIENTE COSTRUITO / ARCHITECTURE, BUILT ENVIRONMENT AND CONSTRUCTION ENGINEERING - 38th cycle

**PNRR_352 Research Field: CONSENSUS PLATFORMS FOR DIGITAL PRODUCTION. HOW
WEB3 TECHNOLOGIES WILL AFFECT THE ARCHITECTURAL, DESIGN AND
CONSTRUCTION COMMUNITY**

Monthly net income of PhDscholarship (max 36 months)
€ 1275.0
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>The purpose of the research is the investigation and application of the protocols offered by Web 3.0 technologies and in particular the "metaverse" in the sphere of construction and more generally of digital manufacturing. The availability of a virtual and shared geometric space opens up new application horizons capable of radically redefining the ways of access, use and definition of the rules of urban planning, architecture and industry, aimed at greater digitization, innovation and competitiveness of the production system and public administration.</p> <p>It should be recalled that among the objectives of the National Recovery and Resilience Plan - PNRR, mission M1C1: DIGITALIZATION, INNOVATION AND SECURITY IN PA includes: Digitize the Italian Public Administration with wide-ranging technological interventions accompanied by structural reforms and in particular:</p> <ul style="list-style-type: none"> • Support the migration to the cloud of central and local administrations, creating a national infrastructure and supporting administrations in the transformation path • Digitize key (citizen and business) user



	<p>procedures/interfaces and the most critical internal processes of administrations</p> <ul style="list-style-type: none"> • Strengthen citizens' basic digital skills. <p>It is believed that the metaverse infrastructure can well represent the points described above, being in fact the evolution of a cloud environment where the citizen is facilitated in internal processes through an intuitive user interface that is geared toward facilitating the enjoyment of digital content.</p> <p>Thus, this area can be framed within investments 1.1, 1.2, 1.4 of the PNRR.</p> <p>Just as the structure of blockchain, together with today's availability of advanced surveying, processing and control tools are the technological premises that have made the utopia of a virtual and shared world technically feasible, the redefinition of the rules of coexistence triggered by the ongoing pandemic and energy revolution are the cultural prerequisites, the historical roots of which will be investigated first and then efficient and sustainable workflows will be defined.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>An application scenario related to the possibility of creating Web 3.0 tools that can serve to know, plan, design and conserve the constituent elements of the space in which we live and interact, improving the effectiveness of current design tools at every level, and limiting their contradictions, will then be defined. In the so called smart city, the possible evolution of Industry 4.0 will be focused on, where the bridge between metaverse and the real world will be represented by intelligent machines capable of materializing virtual assets through assembly technologies or 3d printing, defining new social, economic and production models oriented to a conscious and sustainable use of material and energy resources.</p> <p>The research activity will be conducted within the Indexlab laboratory at Lecco Campus of Politecnico Milano, where there are numerically controlled machines and robots capable of interfacing the real and virtual worlds for the production of artifacts</p> <p>The lab has virtual and augmented reality viewers with which to investigate the relationships between metaverse and real space, and computers equipped with high CPU</p>



	<p>and GPU computing power.</p> <p>GIMAC company has been as the industrial partner have been identified to support this scholarship, the goal of which is to define market scenarios that are inextricably linked to the presence of the metaverse. This partner is involved in the creation of three-dimensional printing machinery capable of autonomously creating human-designed works, not only as subjective expression but as a synthesis of knowledge shared by communities of people expressing current needs. The metaverse represents the ideal meeting point of these communities because it transcends the limits of commonly defined physical space. A period of research abroad is also scheduled at eXngineering company (Manno, Ticino ζ CH), also dealing with technologies related to the metaverse.</p>
<p>Educational objectives</p>	<p>It is believed that this proposal may represent an opportunity for both the candidate and the company, as it represents the correct balance between the need for research in a new but rapidly developing field, driven by the need for innovation and engineering of processes that are still partially inefficient and undergoing rapid obsolescence, and the need on the part of future players to manifest through virtuous workflows their presence early on in this market.</p>
<p>Job opportunities</p>	<p>There are many market surveys that testify to the growing interest in the metaverse theme by all types of industries and in particular those in manufacturing as well as communications. The PhD proposal is supported and co-funded by a company engaged in the development of technologies related to 3d printing, which considers the proposed topic a strategic driver to open up to the markets of the future, both locally and globally, both digital and material.</p>
<p>Composition of the research group</p>	<p>0 Full Professors 0 Associated Professors 1 Assistant Professors 0 PhD Students</p>
<p>Name of the research directors</p>	<p>Dr. Pierpaolo Ruttico</p>



Contacts

Dr. Pierpaolo Ruttico email: pierpaolo.ruttico@polimi.it www.indexlab.it
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Additional support - Financial aid per PhD student per year (gross amount)
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Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad
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Amount monthly	637.5 €
By number of months	0

National Operational Program for Research and Innovation
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Company where the candidate will attend the stage (name and brief description)	GIMAC company - Via Roma, 5, 21040 Castronno (VA) - www.gimac.com
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	eXgineering Company, Stabile Suglio - Via Cantonale 18, 6928, Manno (Ticino, CH) - www.exgineering.com
By number of months abroad	6

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

This scholarship is partially funded by GIMAC company, via Roma 12, 21040 Castronno (VA), Italy (www.gimac.com).

Additional information can be found in the Regulations for the 37th Cycle of ABC-PhD:

download is available at link:

<https://beep.metid.polimi.it/web/abcphd/documenti-e-media>

Additional information about ABC department and ABC-PhD programme:

available at link:

<https://www.dabc.polimi.it/>

Additional support for the research activity:

a total amount of 5.197,62 Euros per student, available since the first year, to be spent according to the department rules.

Study period abroad:

a period of 6 months of study and research at eXgineering Company in Manno (Ticino, Switzerland) is mandatory, preferably during the 1st and/or 2nd year.



Internship in a company:

an internship at GIMAC company in Castronno (VA) is mandatory for a period of 6 months, preferably during the 1st and/or 2nd year.

Desk availability:

the ABC department provides non-permanent desks to be temporarily booked in common PhD rooms. In particular, the activity related to this scholarship will be developed in the Indexlab located in Lecco Campus of Politecnico Milano. The presence in the lab will be mandatory.