POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 41st cycle

THEMATIC Research Field: ARTIFICIAL INTELLIGENCE FOR ADDITIVE MANUFACTURING AND BIOPRINTING

Monthly net income of PhDscholarship (max 36 months)
1500.0 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	Manufacturing is undergoing a profound transformation, driven by increasing geopolitical competition and the urgent need to redefine competitiveness through sustainability—economic, environmental, and societal. To meet these challenges, innovation must simultaneously involve both products and processes, fostering the development of a new industrial ecosystem.At the same time, recent advances in digital technologies and the growing availability of process data are opening new opportunities. Artificial Intelligence (AI)—particularly Generative AI, including Transformers and Transfer Learning—offers powerful tools to develop a new generation of intelligent and adaptive manufacturing systems.This PhD project aims to explore and develop advanced AI methodologies to support smart manufacturing, in situ data mining for process monitoring, adaptive optimization and control with a focus on Additive Manufacturing (AM) and/or Bioprinting. Key areas of investigation will include intelligent sensing and inspection, data fusion, and big data analytics, in situ monitoring. Applications will target critical sectors such as space manufacturing, biomanufacturing, and manufacturing for energy systems.
Methods and techniques that will be developed and used to carry out the research	The research will integrate a diverse set of methodologies, including: • Data mining and machine learning • Industrial statistics

	• Industrial statistics • Generative AI • Image, video-images, multimodal signal data gathering • process monitoring, control and optimization • Advanced experimental design and validation techniques • Engineering knowledge of the targeted manufacturing processes (metal additive manufacturing and bioprinting) The doctoral candidate will operate within highly interdisciplinary teams and will be encouraged to adopt a systems-thinking approach to address complex, real-world manufacturing challenges.Hands-on activities will be conducted in state-of-the-art laboratories equipped with advanced platforms for Additive Manufacturing—including the first installed system in Italy for multimaterial Powder Bed Fusion—as well as a multi-technology bioprinting lab designed to support experimental work across a range of biological and synthetic materials.
Educational objectives	Doctoral candidates will acquire: In-depth knowledge of Artificial Intelligence and big data analytics; Expertise in sensing, monitoring, and process control; Advanced skills in Additive Manufacturing and Bioprinting technologies; Insights into one or more key industrial application domains, including space, aerospace, life sciences, and energy
Job opportunities	Graduates will be well-positioned for careers in academia, research centers, and leading industries worldwide. According to a recent survey on our MeccPhD graduates: -100% found employment within one year of graduation -Average starting salaries were 35% higher than those of MSc holders in the same field Collaborating Institutions:The PhD project benefits from a strong international network, including collaborations with:1. MIT – Massachusetts Institute of Technology (USA), 2.ESA – European Space Agency, 3.Georgia Tech University (USA), 4. Imperial College London (UK), 5. Camozzi Ingersoll Machine Tools (Italy/USA), 6.GE Avio Aero (Italy), 7. Leonardo (Italy) Italy—and Lombardy in particular—holds a leading global position in advanced manufacturing. The convergence of

	AI and manufacturing is fostering the emergence of highly sought-after professional profiles, with strong demand both in academia and industry.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 15 PhD Students
Name of the research directors	Prof. Bianca Maria Colosimo, Marco Grasso

Contacts
For questions about scholarship/support: phd-dmec@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

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

Financial aid is available for all PhD candidates (purchase of study books and materials, funding for participation in courses, summer schools, workshops, and conferences) for a total amount of €6,114.50.

PhD candidates benefiting from this scholarship are required to spend a research period of at least 3 months abroad, joining high-level research groups in their specific research field, as agreed upon with their Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approximately €750/month – net amount). Additionally, candidates who spend at least 3 months abroad are eligible for an extra reimbursement of €3.000 to cover travel expenses.

Teaching assistantship: availability of funding in recognition of supporting teaching activities by the PhD candidate. There are various forms of financial aid for activities related to teaching support. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.