



# PhD in DATA ANALYTICS AND DECISION SCIENCES - 39th cycle

**THEMATIC Research Field: DISTRIBUTED LEARNING METHODS FOR LOCALIZATION AND  
RF HOLOGRAPHY IN DENSE WIRELESS NETWORKS**

**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

The objective of the research activity will be focused on the analysis and development of distributed and scalable machine learning (ML) techniques and methodologies targeting several applications, with a main focus on advanced privacy-by-design localization, Radio Frequency (RF) sensing, perception systems (2D/3D RF holography) and healthcare networks. In particular, RF sensing of objects, subjects, and gestures enables personalized services such as smart living, automated logistics, interaction or personalized/remote healthcare. However, it also challenges ethical and moral boundaries and threatens privacy. Radical re-thinking of technology foundations and new paradigms are thus required to improve scalability, privacy and social compliance. The PhD scholarship will be funded within two Horizon EU projects, Holden: "Ethical Design of Holography with Dense Wireless Networks", and TRUSTroke: "Trustworthy AI for improvement of stroke outcomes". Further info: [www.wavelab.polimi.it](http://www.wavelab.polimi.it)

### Methods and techniques that will be developed and used to carry out the research

The PhD candidate will apply distributed machine-learning (ML) techniques (i.e., federated, decentralized, Bayesian, meta learning and consensus) for privacy-preserving and scalable processing of data. The developed tools will be applied in several application scenarios (healthcare, assisted living, Industry 5.0 and robotics). The researcher will be also involved in different experimental activities within two EU projects funded by the Horizon framework



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<b>Educational objectives</b>	The educational objective is to prepare a researcher with main competences in the distributed machine learning and artificial intelligence (AI) fields but with abilities also in the communication, wireless networks and sensing domains (localization, activity recognition and e-health) and cross-layer co-design aspects. The goal is to educate a researcher able to integrate methodologies from different domains and to apply this integrated knowledge corpus in relevant application scenarios. The researcher will be hosted at Wavelab laboratory co-managed by Politecnico di Milano and CNR.
<b>Job opportunities</b>	Careers are envisioned in any of the leading companies of the information technology, industry and AI (robotics, home automation). Distributed learning compared with classical AI on data centers is challenging the way industry and AI are organized. In the next few years, engineering skills across all domains, mostly related to ICT, will be needed to design, build, troubleshoot, and maintain distributed learning applications in several domains ranging from Industry 5.0, smart home and assisted living (e-health). Since the research is part of Horizon EU research framework, the PhD student will have the chance to interact with the EU partners of the consortium, which include leading industrial and academic players.
<b>Composition of the research group</b>	2 Full Professors 1 Associated Professors 3 Assistant Professors 3 PhD Students
<b>Name of the research directors</b>	Ing. S. Savazzi, Prof. M. Nicoli, Ing. S. Kianoush

#### Contacts

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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
<p>University, research institutes cooperating in the research:</p> <ul style="list-style-type: none"> <li>•Aalto University, (RF sensing, holography)</li> <li>•Oulu University, Centre for Wireless Communications, (distributed learning in wireless dense networks)</li> <li>•CERN (cooperation on federated learning in healthcare nets.)</li> </ul> <p>Companies cooperating in the research:</p> <ul style="list-style-type: none"> <li>•Adant SRL: smart antenna systems: <a href="https://adant.com/">https://adant.com/</a></li> <li>•Alfamation SPA: Industry 5.03. Nora Health: healthcare networks and Federated Learning</li> </ul> <p>There are various forms of financial aid for supporting the teaching practice. The PhD student is encouraged to take part in these activities within limits allowed by the regulations.</p>