



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 1 - Computer Science and Engineering

**PARTENARIATO PNRR Research Field: REINFORCEMENT LEARNING WITH HUMAN IN  
THE LOOP**

**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 research is motivated by the real-world current scenarios in which artificial learning agents interact, for different purposes, with humans to address sequential decision-making processes. The objective of the research activity is the conception, development, theoretical and experimental analysis of reinforcement learning algorithms to address these scenarios. The research activity includes, but is not limited to, the investigation of scenarios characterized by safe learning, adjustable autonomy, human-artificial agent collaboration, teaching, imitation learning, learning from human feedback.

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

The research activity will leverage on:

- *theoretical* methods and techniques including: statistics, probability, (non-)convex optimization, statistical learning theory, information theory, sample and computational complexity analysis;
- *algorithmic* methods and techniques including: reinforcement learning, imitation learning, trust region methods, regret minimization, best-arm identification.

The expected results include complexity (statistical and computational) studies of the related learning problems, novel algorithms with their corresponding theoretical and experimental scrutiny.



<b>Educational objectives</b>	The main objective concerns the advancement of the knowledge of foundational tools of artificial intelligence and machine learning in sequential decision-making problems that involve the interaction between humans and artificial agents. The PhD student will acquire both theoretical and experimental competencies that, upon completion of the program, will allow them to develop original research in academic and/or industrial contexts.
<b>Job opportunities</b>	Researcher, data scientist, machine learning scientist, machine learning engineer
<b>Composition of the research group</b>	1 Full Professors 1 Associated Professors 6 Assistant Professors 20 PhD Students
<b>Name of the research directors</b>	A. Metelli, M. Restelli, N. Gatti

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
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<b>Housing - Foreign Students</b>	--
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<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--
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Scholarship Increase for a period abroad	
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<b>Amount monthly</b>	700.0 €
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<b>By number of months</b>	6
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Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
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EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student 5707,20 Euro

TEACHING ASSISTANTSHIP: (availability of funding in recognition of supporting teaching activities by the PhD student) There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.



COMPUTER AVAILABILITY: individual use

DESK AVAILABILITY: individual use

In the framework of PNRR - PARTENARIATO ESTESO FUTURE ARTIFICIAL INTELLIGENCE RESEARCH D.D. 341 del 15/03/2022 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Istruzione e ricerca Componente 2 Dalla ricerca all'impresa Investimento 1.3, finanziato dall'Unione europea NextGeneration EU CUP: D53C22002380006 DECRETO DI CONCESSIONE: D.D. 1555 del 11/10/2022