



PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 38th cycle

Research Area n. 3 - Systems and Control

**PARTENARIATO PNRR Research Field: MODELING, CONTROL, AND SUPERVISION WITH
MACHINE LEARNING METHODS OF INDUSTRIAL PLANTS AND DISTRIBUTION
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**

This research project is in the framework of
MICS (3A-ITALY)
PARTENARIATO ESTESO MADE IN ITALY CIRCOLARE
E SOSTENIBILE
CUP D43C22003120001
Decreto di Concessione D.D. 1551 del 11/10/2022

New data-driven methods will be developed to design efficient and reliable machine learning algorithms for the modeling, control, supervision, and condition monitoring of industrial systems and distribution networks. These new approaches will allow, from one side, to optimize the production capacity and energy consumption of future digital factories and engineering systems. From the other side, to extend the use of innovative control design techniques to small-medium companies, which could not afford long and expensive procedures required by physics-based control design solutions.

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

Data-driven algorithms will be developed for modeling, control, and condition monitoring of industrial systems. They will be based on classical machine learning approaches, like recurrent neural networks, gaussian processes, gaussian mixture models, and nonparametric



	<p>methods. Applicability of these learning methods for practical control examples will be considered in terms of their ability of explicitly considering safety requirements of real-world systems. In addition, the need to enhance the interpretability of the data-driven solutions, will lead to the definition of hybrid models where a-priori knowledge of the system, in terms of its structure or relations among variables, will be considered in the modeling phase. New model structures will also call for the development of innovative methods for state estimation, taking into account the model structure and based either on moving horizon or EKF approaches.</p>
Educational objectives	<p>Deep knowledge of advanced control and estimation methods based on machine learning, with emphasis on their application to realistic engineering scenarios. Ability to transfer the acquired knowledge and to apply it to uncertain or changing operating conditions.</p>
Job opportunities	<p>The graduate will have strong theoretical and practical knowledge in the fields of modeling, control, and condition monitoring. This will allow to pursue either a career in industry (automation companies, R&D or project management roles), or in academia. Recent PhD graduates have been employed by RSE, ABB Corporate Research Center, and Electrolux.</p>
Composition of the research group	<p>1 Full Professors 1 Associated Professors 1 Assistant Professors 3 PhD Students</p>
Name of the research directors	<p>Riccardo Scattolini</p>

Contacts	
<p>riccardo.scattolini@polimi.it tel. 02-23993539 mob. 3338997661 https://scattolini.faculty.polimi.it/</p>	

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)	--
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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

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

5.707,13 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

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 – NextGenerationEU