



PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 41st cycle

Research Area n. 4 - Telecommunications

THEMATIC Research Field: ARTIFICIAL INTELLIGENCE SOLUTIONS FOR RESOURCE MANAGEMENT AND SENSING IN FUTURE COMMUNICATION NETWORKS

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

While the foundations for integrating sensing capabilities into communication networks are being established, several challenges and research opportunities remain unaddressed. The proposed research intends to leverage field data derived from current production networks (e.g., signal quality indicators, alarms, traffic information) to implement Network as a Sensor (NaS) applications for a broad range of environmental monitoring tasks, such as weather predictions, monitoring air quality, and observing changes in the landscape. Moreover, given the distributed and heterogeneous nature of relevant sources of data leveraged for network sensing, distributed training of AI models is expected to become an effective solution to balance heavy data transfer and AI models performance. The specific objectives of the research are: 1) to develop Artificial Intelligence (AI)-based algorithms addressing network-related (e.g., failure management) and non-network-related (e.g., weather forecast) use cases, utilizing data from both microwave networks and other conventional data sources (e.g., weather stations), 2) to perform experimental activity for the distributed training of AI models in a small-scale testbed managed by decentralized control systems.

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

Methodologies and techniques that will be leveraged for



research	this research come from the field of statistical learning and data analysis. State-of-art container management/orchestration (e.g., based on Kubernetes) and virtualization techniques will be adopted to develop the building blocks for real-time network data ingestion pipeline.
Educational objectives	The PhD student will learn how to apply network data analysis and machine learning tools to address network-related (e.g., failure management) and non-network-related (e.g., weather monitoring) use cases in future communication networks.
Job opportunities	There is a very strong request of PhD students with specific background knowledge in the field of network data analysis and AI-based solutions for network management. Recently, some of our former PhD students have been hired in top high-tech companies as Google, Nokia or Meta.
Composition of the research group	1 Full Professors 4 Associated Professors 4 Assistant Professors 7 PhD Students
Name of the research directors	Prof. Massimo Tornatore

Contacts
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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
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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.

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:

1st year: Yes

2nd year: Yes

3rd year: Yes