

# RESTART – Decentralised AI for Pervasive Systems

## Background

The explosion of the number of IoT and Edge devices is boosting the generation of massive amounts of data at the Edge of the Internet. In parallel, the knowledge extraction process from these data for training AI models is facing a paradigm shift, from centralised solutions run in remote Cloud facilities to more decentralised and lightweight ones executed at the Edge of the Internet. Performing collaborative training in an Edge environment poses several challenges, all connected to the extreme heterogeneity of the context, i.e., data patterns might be represented unevenly across devices, devices have limited resources that might prevent or limit their contribution to the process, the locality experience by each device in training the local AI model might affect the overall process. A distributed training framework, i.e., Federated Learning, has already been proposed to tackle some of these challenges, but several aspects remain to be investigated.

## Topic description

The topic addresses the challenges posed by executing a decentralised training process in an Edge environment. In this line of work, the idea is to generalise Federated Learning by moving from a centrally controlled system to a fully decentralised one. The devices that collaborate in the decentralised training have to face not only the intrinsic heterogeneity of the system but also the lack of central coordination, moving the perspective from a system with global information to another where locality is the only reality for devices. The primary focus will be to design decentralised training algorithms through which the devices can train the local models, overcoming their local perspective by embedding the knowledge contained in the AI models of the devices they are in contact with. Due to devices' limited computational and communication resources, the algorithms must be efficient and robust to several sources of heterogeneity. The output of this topic will be a set of communication-efficient decentralised training algorithms.

## Type of prospect positions

We plan to open positions at the level of Researcher on this topic.

## Funding and partnerships

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## Candidate profile

Ideal candidates should have obtained a PhD degree (or have a 3-year professional experience in research) in Computer Science, Wireless Networking, Computer Engineering, Telecommunications Engineering, Mathematics, Physics or closely related disciplines, and a proven track record of excellent scientific publications. Preferably, the PhD should be in Artificial Intelligence, Pervasive Systems, Networking.

## Contacts



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