

# Post-doctoral position : Energy-Efficient Distributed Machine Learning

Signal and Communications department, IMT Atlantique, Brest, France

The position is expected to start between January and March 2020, and is for one year

## **Project description**

Learning tasks realized by centralized servers collecting data from users usually show problems in terms of privacy. This is why we would like to propose solutions for users who wish to use their smartphones in order to realize learning tasks in common, without having to rely on a centralized server. As potential applications, we can think of content recommendation, traffic prediction, event detection such as crowd movement, or 3D reconstruction of a scene captured by different persons.

For this, there is a need to implement efficient decentralized machine learning algorithms, in which each smartphone would do a part of the computation operations. This requires that the users share a part of their data with each other. But data exchange is energy consuming and creates problems in terms of privacy.

In order to address these issues, we propose to realize the learning directly over compressed data, without reconstructing the original information prior to learning. Compression reduces the amount of data transmitted from one user to the others, and avoiding data reconstruction lowers the amount of computation operations. These two strategies hence lower the energy consumption required by the learning task. In addition, recent works showed that, for certain learning problems, one can compress the data so much so that it is not possible anymore to reconstruct the original data (coding rate smaller than entropy), but it is still possible to apply learning directly over compressed data. This shows that there is a need to properly dimension the compression system in order to address the tradeoff between privacy and learning efficiency.

The objective of this project is then to propose and design decentralized learning algorithms applied over compressed data. For this, we will use and develop tools in the areas of machine learning and source coding.

## **How to apply**

We are looking for candidates with a PhD in at least one of the following two domains : source coding and machine learning To apply, please contact Elsa Dupraz (elsa.dupraz@imt-atlantique.fr). Please provide a detailed CV, a brief statement of motivations for this position, and two references.