



INTERNSHIP PROGRAM FOR INTERNATIONAL STUDENTS

INTERNSHIP SUBJECT FORM

Name of the Host Laboratory	Centre de Mathématiques Appliquées
Website of the Host Laboratory	
Research Group	SIMPAS
Internship Supervisor	Aymeric DIEULEVEUT
Internship Subject	Distributed stochastic gradient descent algorithms in non i.i.d. settings
Student's level	<input type="checkbox"/> Advanced Undergraduate Students (3 rd or 4 th year) <input checked="" type="checkbox"/> Master's students (1 st or 2 nd year) <input checked="" type="checkbox"/> PhD students
Proposed Duration	<input checked="" type="checkbox"/> 3 months <input checked="" type="checkbox"/> 4 months <input checked="" type="checkbox"/> 5 months <input checked="" type="checkbox"/> 6 months
Prerequisites	A good knowledge of convex optimization and Statistics. Python programming
Internship description (max. 15 lines)	<p>Stochastic Gradient Descent is one of the most important algorithms in modern Optimization and Machine Learning. In the classical setting, observations are assumed to be independently sampled from one distribution ("i.i.d."). However, while this assumption is valid in simple learning situations, it is very restrictive in more general settings. For example, in <i>Federated Learning</i>, where data parallel training settings can be used, the distribution of observations may change between the different storing (and computing) units.</p> <p>The goal of this internship is to analyze the behavior of distributed stochastic gradient descent algorithms (especially Local-SGD) in the context of non i.i.d. data, and/or in high dimensional settings, and to propose and implement (in Python) new algorithms. To do so, we combine results from optimization and statistical (stability, Rademacher complexity) frameworks.</p>