

**ADVANCED TOOLS FOR LEARNING : WHEN CONVEXITY MEETS SPARSITY****PRACTICAL MATHEMATICS****Lecturers:** Céline HARTWEG-HELBERT, Yohann DE CASTRO

| Lecturers : 15.0 | TC : 15.0 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : AN

**Objectives**

Sparsity and convexity are ubiquitous notions in Machine Learning and Statistics. In this course, we study the mathematical foundations of some powerful methods based on convex relaxation: L1-regularisation techniques in Statistics and Signal Processing; Nuclear Norm minimization in Matrix Completion. These approaches turned to be Semi-Definite representable (SDP) and hence tractable in practice. The theoretical part of the course will focus on the guarantees of these algorithms under the sparsity assumption. The practical part of this course will present the standard solvers of these learning problems.

**Keywords :** L1-regularization; Matrix Completion; Semi-Definite Programming; Proximal methods;**Programme****Learning outcomes****Independent study**

Objectifs :

Méthodes :

**Core texts**

Christophe Giraud, *INTRODUCTION TO HIGH-DIMENSIONAL STATISTICS*, Chapman and Hall/CRC  
Martin J. Wainwright *HIGH-DIMENSIONAL STATISTICS: A NON-ASYMPTOTIC VIEWPOINT*, Cambridge University Press  
Simon Foucart and Holger Rauhut *A MATHEMATICAL INTRODUCTION TO COMPRESSIVE SENSING*

**Assessment**