

## Introduction to Convex Optimization for Machine Learning

Course title – Intitulé du cours	Introduction to Convex Optimization for Machine Learning
Level / Semester – Niveau /semestre	1
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsable	
Other teacher(s) – Autre(s) enseignant(s)	
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Other teacher(s) – Autre(s) enseignant(s)	
Lecture Hours – Volume Horaire CM	30
TA Hours – Volume horaire TD	15
TP Hours – Volume horaire TP	
Course Language – Langue du cours	English
TA and/or TP Language – Langue des TD et/ou TP	Python

### **Teaching staff contacts – Coordonnées de l'équipe pédagogique :**

### **Course Objectives – Objectifs du cours :**

The course is splitted into three parts.

- The first part introduces and motivates the need to use for data science problems.
- The second part of the course is dedicated to convex optimization (with an emphasis to the theoretical and practical side) and recent modern improvements of accelerated optimization algorithms (with an emphasis to the practical side). This part starts with some reminders on convex sets and functions.
- The last part is dedicated to constrained problems and primal dual problems, to the primal dual formulations and to the associated algorithms derived from this formulation.  
Background: KKT, Lagrange multipliers, etc.

### **Prerequisites – Pré requis :**

Analysis, Calculus, Notion of Python

### **Practical information about the sessions – Modalités pratiques de gestion du cours :**

Personal laptops and tablets are accepted in the class

### **Grading system – Modalités d'évaluation :**

Mid Term and Final Exam or Project and Final Exam (not fixed yet)

### **Bibliography/references – Bibliographie/références :**

*Convex Optimization* [Stephen Boyd](#) and [Lieven Vandenberghe](#)  
<https://web.stanford.edu/~boyd/cvxbook/>

Lectures on convex optimization, Y. Nesterov

### **Session planning – Planification des séances**

#### **Distance learning – Enseignement à distance :**

*Distance learning can be provided when necessary by implementing:*

- *Interactive virtual classrooms*
- *Recorded lectures (videos)*
- *MCQ tests and other online exercises / assignments*
- *Remote (online) tutorials (classes)*
- *Chatrooms*

*En cas de nécessité, un enseignement à distance sera assuré en mobilisant:*

- *Classe en ligne interactive*
- *Vidéo enregistrée de la présentation du matériel pédagogique*
- *QCM et exercices en ligne*
- *TP/TD à distance*
- *Forum...*