

Optimization

Màster de Fonaments de Ciència de Dades



UNIVERSITAT_{DE}
BARCELONA

Ignasi Cos

Labs (Mondays 14-16)

Kostiantyn (Kostya) Drach

Lectures (Fridays 16-18)

2023

Plan of the course:

1. **Introduction to optimization** (first examples and general principles, crash-course of analysis) *1 lect*
2. **Introduction to gradient descent methods** *4 lect*
 - a. First order gradient descent methods
 - b. Second order gradient descent methods
3. **Stochastic optimization methods** (noisy descent, simulated annealing, etc.) *2 lect*
4. **Constrained optimization** *4 lect*
 - a. Equality constraints (Lagrange multipliers)
 - b. Inequality constraints
 - c. Penalty methods (turning constrained optimization into unconstrained)
5. **Convex optimization** (linear constrained optimization, simplex method, etc.) *2 lect*
6. **Heuristic optimization methods** (genetic algorithms, ant colony optimization, etc.) *1 lect*

References:

1. Mordecai Avriel: *Nonlinear Programming*. Prentice-Hall, Inc., 2003 (Dover edition).
2. Dimitri Bertsekas: *Nonlinear Programming*. Athena Scientific, 2003.
3. Igor Griva, Stephen Nash, Ariela Sofer: *Linear and Nonlinear Optimization*. SIAM, 2009.
4. Mykel Kochenderfer, Tim Wheeler: *Algorithms for optimization*. The MIT Press, 2019
5. Jorge Nocedal, Stephen Wright: *Numerical Optimization*. Springer 2006 (Second Edition).
6. [Lecture slides, laboratory handouts](#), Campus Virtual UB, 2023.

Calendar (Room T1)

Lectures

Friday, 16:00-18:00

Labs

Monday, 14:00-16:00

Holidays (or forced holidays)

September						
M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

October						
M	T	W	T	F	S	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

November						
M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

December						
M	T	W	T	F	S	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Evaluation, contact emails, office hours:

Laboratory projects 50%	Exercises 20%	Final exam 30%
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	Contact emails	Office hours*
Ignasi Cos	ignasi.cos@ub.edu	Monday 12:00-14:00 (P2-33)
Kostya Drach	kostiantyn.drach@ub.edu	Friday 14:00-16:00 (E1-01)