

Optimization

Màster de Fonaments de Ciència de Dades

Ignasi Cos (Laboratory projects) & Xavier Jarque (Theory and exercises)

Contents

PART I. Preliminars

1. Introduction to optimization
2. Mathematical notation and background

PART II. Analysis

3. Unconstrained and constrained optimization with equalities. Optimality conditions.
4. Constrained optimization. Optimality conditions.
5. Convex sets and functions.

PART III. Methods

6. One-dimensional optimization. Newton's and secant method.
7. Gradient methods for unconstrained optimization.
8. Multidimensional unconstrained optimization without derivatives. Conjugate direction methods.
9. Stochastic optimization.
10. Heuristic optimization methods.

PART IV. Linear Programing

11. Simplex method.
12. Duality.

References

1. Mordecai Avriel: *Nonlinear Programming*. Prentice-Hall, Inc., 1976, 2003 (Dover edition).
2. Dimitri P. Bertsekas: *Nonlinear Programming*. Athena Scientific, 2003.
3. Jorge Nocedal and Stephen J. Wright : *Numerical Optimization*. Springer Series in operation Reseach, Springer 2006 (Second Edition).
4. Lecture notes slides, and laboratory slides, Campus Virtual UB, 2022.

Calendar (Room: T1)

| September | | | | | | | October | | | | | | |
|-----------|----|----|----|----|----|----|---------|----|----|----|----|----|----|
| Mo | Tu | We | Th | Fr | Sa | Su | Mo | Tu | We | Th | Fr | Sa | Su |
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| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 26 | 27 | 28 | 29 | 30 | | | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
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| November | | | | | | | December | | | | | | |
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| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 28 | 29 | 30 | | | | | 26 | 27 | 28 | 29 | 30 | 31 | |

In red, regular lecture (13), Tuesday 16:00–18:00

In blue (cyan), laboratory (presentation) session (12), Mondays 14:00–16:00

In green, holidays. In pink, weekends.

Evaluation

Laboratory projects + exercises + final exam

- ▶ **50% laboratory projects**
- ▶ **20% exercises**
- ▶ **30% final exam**

Contact emails

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Office hours

- ▶ Ignasi Cos Monday 12-14 (P2-33)
- ▶ Xavier Jarque Tuesday 13-14 (P1-15)