



UNIVERSITÀ DI PISA  
DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE  
Dottorato di Ricerca in Ingegneria dell'Informazione

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Doctoral Course

**Optimization Methods and Algorithms**

Prof. Germán Arévalo

*Universidad Politécnica Salesiana – Ecuador*

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**Short Abstract:** The aim of the course is to provide a comprehensive understanding of the most commonly used optimization methods and algorithms in the field of information engineering research. The course will include practical exercises using MATLAB.

**Course Contents in brief:**

- Mathematical optimization
- LS and linear programming
- Combinatorial optimization
- Convex optimization
- Geometric optimization
- Approximation algorithms for NP-hard problems

**Total # of hours of lecture:** 12

**References:**

- [1] Mykel J. Kochenderfer and Tim A. Wheeler. Algorithms for Optimization. Mit Press, 2019.
  - [2] Jorge Nocedal and Stephen Wright. Numerical Optimization. 2nd Edition. Springer, 2006.
  - [3] Stephen Boyd and L Vandenberghe. Convex Optimization. Cambridge University Press, 2004.
  - [4] Papadimitriou, Christos & Steiglitz, Kenneth. Combinatorial Optimization: Algorithms and Complexity. Dover Publications, NY, 1998.
  - [5] Dorit S. Hochbaum. Approximation Algorithms for HP-Hard problems. University of California, Berkeley, 1996.
  - [6] Michael R. Garey and David S. Johnson. Computers and intractability. A guide to the theory of NP completeness, Bell Laboratories, NJ, 1990.
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## CV of the Teacher

**GERMÁN V. ARÉVALO (Senior Member, IEEE)** received his Engineering degree in Electronics Engineering from Escuela Politécnica Nacional, Quito, Ecuador, in 2003, his Master's degree in Optical Communications and Photonic Technologies from Politecnico di Torino, Turin, Italy, in 2004, and his Ph.D. degree in Optical Communications from Universidad Pontificia Bolivariana, Medellin, Colombia, in 2015. He is currently a Full Professor, the Telecommunications Research Group (GIETEC) Director, and the Telecommunications Engineering Program Director at Universidad Politécnica Salesiana, Ecuador. His current research interests include physical impairments and optimization models for next-generation optical access networks.

### Final Exam: method of final examination

- Final project (optimization exercise) in MATLAB.

### Room and Schedule

Room: *Aula Riunioni del Dipartimento di Ingegneria dell'Informazione, Via G. Caruso 16, Pisa – Ground Floor*

Schedule:

Day 1: March 10, 2025, h. 14.30-17.30, Mathematical optimization and LS and linear programming (3 hours).

Day 2: March 11, 2025, h. 14.30-17.30, Combinatorial optimization (3 hours)

Day 3: March 12, 2025, h. 14.30-17.30, Convex and geometric optimization (3 hour)

Day 4: March 13, 2025, h. 14.30-17.30, Approximation algorithms for NP-hard problems (3 hours)