

**Friday April 17, 2pm to 7pm, room 5.7**

**Approximate Solution of Optimization Problems**

Contents

1. Mathematical models of combinatorial optimization problems
2. Approximation algorithms
3. Heuristic algorithms
4. Metaheuristic algorithms

**Friday November 20, Friday November 27, Friday December 4, Friday December 11, 2pm to 7pm, room 5.2**

**Models and Algorithms for Matching and Assignment Problems (4 lectures, 5 hours each)**

Contents

- 1. Introduction:** matching, assignment, graphs, bipartite graphs, adjacency matrix, incidence matrix;
- 2. Theoretical foundations:** matching problems, Hall's marriage theorem, Koenig's algorithm, augmenting path, complexity, stable marriage problem;
- 3. Maximum matching applications:** vehicle scheduling, time slot assignment (TDMA), open shop scheduling;
- 4. Linear sum assignment problem:** weighted matching, constraint matrix, unimodularity, duality, Egervary's theorem, initialization algorithms;
- 5. The Hungarian algorithm:** main structure, rooted alternating tree, complexity, Kuhn's algorithm, Jacobi's theorem;
- 6. Non-Hungarian algorithms:** Dinic-Kronrod's algorithm, primal simplex algorithms, Egervary's algorithm, Birkhoff-Von Neumann theorem;
- 7. Other linear assignment problems:** k-cardinality assignment, bottleneck assignment, threshold algorithm, balanced assignment ;
- 8. Quadratic assignment problems:** combinatorial formulation, complexity, integer quadratic formulation, inner product formulation, trace formulation, exact solution, heuristics.

**The slides of each lecture will be available few days in advance at my web page:**

[http://www.or.deis.unibo.it/staff\\_pages/martello/cvitae.html](http://www.or.deis.unibo.it/staff_pages/martello/cvitae.html) → Courses → PhD courses

**It is recommended to print the slides.**

**LAPTOPS, SMART/CELL PHONES, etc must be switched off during lectures.**