- Faculté des sciences économiques
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# Probabilistic Algorithms (6 ECTS) (5MI2008)

| Filières concernées | Nombre d'heures | Validation | Crédits ECTS |
|---|---|---|---|
| **Master en informatique** | **Cours: 4 ph** | **cont. continu** | 5 |
| **Master en méthodologie d'enquête et d'opinion publique** | **Cours: 4 ph** | **cont. continu** | 6 |
| **Master en statistique** | **Cours: 4 ph** | **cont. continu** | 6 |
| **Master en systèmes d'information** | **Cours: 4 ph** | **cont. continu** | 6 |

ph=période hebdomadaire, pg=période globale, j=jour, dj=demi-jour, h=heure, min=minute

**Période d'enseignement:**

- Semestre Automne

**Equipe enseignante:**

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**Objectifs:**

A student attaining this course should be able:
- to identify the randomized characteristic of an algorithm and to classify it as Monte Carlo or Las Vegas type
- to identify the parameters of an optimization problem (loss function, landscape, random noise)
- to select and to implement (using MATLAB environment) the appropriate stochastic algorithm for solving the optimization problem

**Contenu:**

The course starts with an introduction of the concept of randomized algorithms (examples, types) and of random number generators, but the core of the course provides a survey of many of the most important methods in stochastic search and optimization. The first part of the course will concentrate on optimization heuristic approach (random search and non-linear simplex, simulated annealing, genetic algorithms and evolution strategies - including ant colony and particle swarm), whereas the second part is dedicated to stochastic approximation approach (finite difference method, stochastic gradient, simultaneous perturbations). Although the theoretical bases of the algorithms are presented in a rigorous manner, the proofs of these results are not included. The implementation of the enumerated algorithms, for solving the classical Traveling Salesman Problem, is made in MATLAB.

**Forme de l'évaluation:**

- Lab assignments (individual exercises and team project): 40% of final grade
- Written exam during last week of semester (2 hours): 60% of final grade
- Resit: 2 hours written exam (autumn session): 100% of final grade

**Documentation:**

- Introduction to Stochastic Search and Optimization, James C. Spall, 2003, John Wiley & Sons
- Stochastic Optimization, J. Schneider and S. Kirkpatrick, 2006, Springer
- MATLAB doc, http://www.mathworks.com/access/helpdesk/help/techdoc/index.html