

AIBT105 – Optimization topics for AI

From the Advanced Master AIBT

(Artificial Intelligence and Business Transformation)



Artificial intelligence is creating new jobs and new ways of working. This is crucial to acquire some basic knowledge about AI and big data in order to lead one's firm and teams through change and transformation challenges.

Skills learned

After completing this course, participants will be able to:

- Model a decision making problem as an optimization problem;
- Know the main categories of optimization algorithms for AI;
- Choose an appropriate optimization algorithm for a specific problem.

Prerequisites

- General knowledge on computer science, mathematics, and algorithmics.
- The Python programming language will be used throughout the course, but only a prior basic experience in programming is required.

Key elements

Dates:

3 - 6 February 2020

Duration:

28 hours, 4 days

For whom:

recent graduates, jobseekers and experienced employees

Location:

ISAE-SUPAERO, Toulouse

Course fees: 2300 €

Language: English

Learning objectives

Artificial Intelligence is mainly about providing the best information to the right person at the right time. This almost always implies an underlying optimization process. Getting to know the optimization methods behind modern AI is therefore a crucial asset.

How to find the most intelligent imaging plan for a satellite constellation, or the best dispatching of aircraft around an airport? How to minimize the number of calls to a CSM solver when looking for the perfect aircraft wing design? Why is convergence in Deep Learning such a critical issue? All these hands-on problematics will drive our discovery of optimization methods for AI.

Practical information and registration

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Programme

- *Introduction;*
Artificial Intelligence, Machine Learning and Optimization:
what? why? how?
- *Gradient Descent Optimization: walking downhill;*
Interactive introduction: linear regression, linear separation;
Overview of gradient based optimization methods;
Hands-on: Program your own gradient descent;
Concluding remarks: Why is convergence in Deep Learning
such a critical issue?
- *Discrete optimization: solving combinatorial problems;*
Overview of discrete satisfaction and optimization methods;
Interactive session: Branch and Bound applied to MILP and
CSP;
Hands-on: Modelling exercises;
Challenge: the Orbit Transition Problem;
Concluding remarks: Scaling issues, opening on
metaheuristics;
- *Metaheuristics: the compromise between speed and
quality;*
Overview: Single-state methods and Population methods;
Hands-on: Program your own simulated annealing;
Interactive session: Discovering genetic algorithms;
Challenge: Aircraft conflict resolution with Genetic Algorithms;
Concluding remarks: other stochastic methods, CMA-ES, cross-
entropy.