

# AIBT2 – Modern Artificial Intelligence

From the Advanced Master AIBT

(Artificial Intelligence and Business Transformation)



## Highlights

- Foundations of AI algorithms
- Mainstream Machine Learning algorithms
- Reinforcement Learning algorithms
- Practical courses

Getting to know the optimization methods behind modern AI is a crucial asset.

Extracting knowledge and value from finite data in an automated way is the goal of Machine Learning. It aims at giving computers the ability to learn with data, without being explicitly programmed.

Reasoning and planning ahead. Understanding the foundations and mechanics of Reinforcement Learning, AI planning and scheduling techniques.

## 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 February 2020 – 14 May 2020**

Duration: **84 hours, 12 days**

For whom:

**recent graduates, jobseekers and experienced employees**

Location:

**ISAE-SUPAERO, Toulouse**

Course fees: **5 000 €**

Language: **English**

## Learning objectives

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;
- Link some field problems to their formal Machine Learning counterparts;
- Know the main bottlenecks and challenges of data-driven approaches;
- Decide which method is relevant to solve a sequential decision problem;
- Know the foundations of RL, path planning, scheduling and decentralized decision methods.

## Practical information and registration

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## Course Content

### AIBT105 – Optimization topics for AI (28h):

- Artificial Intelligence, Machine Learning and Optimization;
- Gradient Descent Optimization;
- Overview of gradient based optimization methods;
- Convergence in Deep Learning;
- Discrete optimization: solving combinatorial problems;
- Metaheuristics: the compromise between speed and quality;
- Interactive session: Discovering genetic algorithms;
- Challenge: Aircraft conflict resolution with Genetic Algorithms;
- Concluding remarks: other stochastic methods, CMA-ES, cross-entropy;

### AIBT106 – Machine learning and data analytics (28h):

- The data analytics workflow;
- General overview of Machine Learning;
- Unsupervised Learning;
- Geometrical & probabilistic approaches in Supervised Learning;
- Bio-inspired ML, Neural Networks and Deep Learning;
- Feature engineering and data preprocessing;

### AIBT108 – Sequential Decision Making in AI (28h):

- Reinforcement Learning (RL);
- Scheduling and different optimization methods and modeling frameworks;
- Shortest path algorithms, heuristic search, motion planning;
- Decentralized decision making;
- Multi-agent concepts and game theory. Collaborative and adversarial decision making.