2EL1580 – Artificial Intelligence

Instructors: Fabrice Popineau
Department: DÉPARTEMENT INFORMATIQUE
Language of instruction: ANGLAIS
Campus: CAMPUS DE PARIS - SACLAY
Workload (HEE): 60
On-site hours (HPE): 35,00
Elective Category : Fundamental Sciences
Advanced level : Yes

Description

What do web-based information retrieval, personal assistant development, autonomous driving or automatic planning have in common?
These are all complex real-world problems that artificial intelligence (AI) aims to solve by addressing them with rigorous methods.
In this course, you will study the fundamental principles that guide these applications and implement some of these systems.
Specific topics include automatic learning, state space search, gaming, Markov decision processes, constraint satisfaction, graphic models and logic.
The main objective of the course is to provide you with a framework to address new AI problems that you may encounter in the future.
The ethical and philosophical aspects of AI will also be discussed.

Quarter number

SG8

Prerequisites (in terms of CS courses)

Information Systems and Programming Courses
Algorithmic and Complexity Course
Basics of probability: random variable, Bayes theorem

Syllabus

- Introduction - Presentation of the domain
- Agents and agent architectures
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- Machine learning and reflex agents
    - Linear predictors
    - Loss function and optimization

    - Neural networks
- State representation and search
    - Planners
    - Adversarial search
    - Utility functions
    - Markov decision processes
    - Reinforcement learning
- Variable-based representation
    - Uncertain knowledge
    - Probabilistic reasoning
    - Bayesian Networks
    - Simple and complex decision making
- Logic-based representation
    - Propositions and predicates
    - Syntax vs. semantics
    - Inference systems
- Conclusion
    - Deeper on deep learning
    - Future of AI

Class components (lecture, labs, etc.)

The course scheduling includes about 18h of lectures and 15h of supervised work.

The supervised work sessions are inserted every second class lecture.

Grading

The overall assessment will be based on:

- a continuous assessment grade on the programming projects (mandatory, 40% of the final grade)
- a 2-hour final exam with documents (60% of the final grade).

Course support, bibliography

Artificial Intelligence : a Modern Approach, 4th ed. (English)
Auteurs : Stuart Russel, Peter Norvig
ISBN : 9780134610993
Editeur : Pearson

Resources

- Teaching team (names of the teachers of the lectures): Fabrice Popineau (lectures)

- Size of the supervised work sessions (by default 25 students): 25 students, supervision capacity of 100 students with teachers (Bich-Liên Doan, Arpad Rimmel, Yolaine Bourda, ...)
- Software tools and number of licenses required: No licenses. Free tools: Python and its libraries mostly.

Learning outcomes covered on the course

By the end of this unit, students will be able to:
- identify the problems for which artificial intelligence techniques are suitable and when it is the case to identify the appropriate techniques,
- formalize a given problem in the language/framework of different AI techniques,
- implement elementary AI algorithms (e. g. state space search algorithms),
- design and implement an evaluation of different algorithms on a formalization of a problem, and draw conclusions from this evaluation.

Description of the skills acquired at the end of the course

C6.4 Solve problems in a computational thinking process
C6.5 Use any type of data, structured or unstructured, including massive data.