

CS-430

**Intelligent agents**

Faltings Boi

Cursus	Sem.	Type
Computer and Communication Sciences		Opt.
Computer science minor	H	Opt.
Computer science	MA1, MA3	Opt.
Cybersecurity	MA1, MA3	Opt.
Data Science	MA1, MA3	Opt.
Data science minor	H	Opt.
Financial engineering minor	H	Opt.
Financial engineering	MA1, MA3	Opt.
Learning Sciences		Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Opt.

Language of teaching	English
Credits	6
Session	Winter
Semester	Fall
Exam	During the semester
Workload	180h
Weeks	14
<b>Hours</b>	<b>6 weekly</b>
Courses	3 weekly
Exercises	3 weekly
<b>Number of positions</b>	

**Summary**

Software agents are widely used to control physical, economic and financial processes. The course presents practical methods for implementing software agents and multi-agent systems, supported by programming exercises, and the theoretical underpinnings including computational game theory.

**Content**

The course contains 4 main subject areas:

1) Basic models and algorithms for individual agents:

Models and algorithms for rational, goal-oriented behavior in agents: reactive agents, reinforcement learning, exploration-exploitation tradeoff, AI planning methods.

2) Multi-agent systems:

multi-agent planning, coordination techniques for multi-agent systems, distributed algorithms for constraint satisfaction.

3) Self-interested agents:

Models and algorithms for implementing self-interested agents motivated by economic principles: elements of computational game theory, models and algorithms for automated negotiation, social choice, mechanism design, electronic auctions and marketplaces.

4) Implementing multi-agent systems:

Agent platforms, ontologies and markup languages, web services and standards for their definition and indexing.

**Learning Prerequisites****Recommended courses**

Intelligence Artificielle or another introductory course to AI

**Learning Outcomes**

By the end of the course, the student must be able to:

- Choose and implement methods for rational decision making in software agents, based on decision processes and AI planning techniques
- Choose and implement methods for efficient rational decision making in teams of multiple software agents
- Model scenarios with multiple self-interested agents in the language of game theory
- Evaluate the feasibility of achieving goals with self-interested agents using game theory

- Design, choose and implement mechanisms for self-interested agents using game theory
- Implement systems of software agents using agent platforms

### Teaching methods

Ex cathedra, practical programming exercises

### Expected student activities

Lectures: 3 hours

Reading: 3 hours

Assignments/programming: 4 hours

### Assessment methods

Midterm and quizzes 30%, final exam 70%

### Resources

#### Bibliography

Michael Wooldridge : An Introduction to MultiAgent Systems - Second Edition, John Wiley & Sons, 2009  
Stuart Russell and Peter Norvig: Artificial Intelligence: A Modern Approach (2nd/3rd/4th Edition), Prentice Hall Series in Artificial Intelligence, 2003/2009/2015.

#### Ressources en bibliothèque

- [An Introduction to MultiAgent Systems / Wooldridge](#)
- [Artificial Intelligence: A Modern Approach / Russell](#)

#### Moodle Link

- <https://go.epfl.ch/CS-430>