Course guide
270742 - SOAS - Self Organizing Multiagent Systems

Last modified: 02/02/2024

Unit in charge:	Barcelona School of Informatics
Teaching unit:	1004 - UB - (ENG)Universitat de Barcelona.

Degree:	MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE (Syllabus 2017). (Optional subject).

Academic year: 2023   **ECTS Credits:** 4.5   **Languages:** English

LECTURER

Coordinating lecturer:	MAITE LOPEZ SANCHEZ

Others:

PRIOR SKILLS

It will help to know about MAS (Multi-Agent Systems)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.
CEA7. Capability to understand the problems, and the solutions to problems in the professional practice of Artificial Intelligence application in business and industry environment.
CEA9. Capability to understand Multiagent Systems advanced techniques, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEP2. Capability to solve the decision making problems from different organizations, integrating intelligent tools.
CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.
CEP4. Capability to design, write and report about computer science projects in the specific area of ??Artificial Intelligence.

Generical:
CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.

Transversal:
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT7. ANALISIS Y SINTESIS: Capability to analyze and solve complex technical problems.

TEACHING METHODOLOGY

The course unit will be taught through a series of theory and practical sessions:

- Participatory theory sessions in which new concepts are introduced and discussed between students. Group discussion is strongly encouraged. Textbook chapters and research papers will be provided to facilitate debate and exchange of ideas.

- Practical sessions in which students put into practice previously introduced concepts to gain further insight. This objective will be achieved by solving problems, designing systems, and developing prototypes.

As far as possible, the gender perspective will be incorporated in the development of the subject. In addition, the teaching staff will be attentive to those specific gender needs that the students may raise, such as being able to choose a partner of the same gender if group work is carried out or being able to pose challenges against the gender gap.

LEARNING OBJECTIVES OF THE SUBJECT

1.Learning objectives referring to knowledge:
2.Objectives referring to abilities, skills:
Students will acquire the capacity to determine which applications are compatible with the implementation of agent-oriented solutions and how these solutions can adapt automatically to periodic changes.
They will also become able to develop simulations of multi-agent systems and analyse how they perform globally.
4.Objectives referring to attitudes, values and norms:
Students will develop teamwork skills and will reflect on ethical / moral aspects associated to autonomous systems.

STUDY LOAD

Type	Hours	Percentage
Hours small group	7,5	6.67
Guided activities	3,0	2.67
Self study	72,0	64.00
Hours large group	15,0	13.33
Hours medium group	15,0	13.33

Total learning time: 112.5 h

CONTENTS

Introduction to multi-agent systems

Description:
* Cooperative vs competitive agents, * Social models, * Organizations * Institutions * Applications

Agent-based simulation

Description:
* Individual modelling, * Social analysis, * Tools & case studies

Adaptation and coordination

Description:
* Normative Multi-Agent systems * Moral agents * Multi-Agent Reinforcement Learning.

ACTIVITIES

Presentation and discussion of a research paper

Specific objectives:
1

Related competencies :
CEP4. Capability to design, write and report about computer science projects in the specific area of ??Artificial Intelligence.
CEA9. Capability to understand Multiagent Systems advanced techniques, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEA7. Capability to understand the problems, and the solutions to problems in the professional practice of Artificial Intelligence application in business and industry environment.
CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.
CEP2. Capability to solve the decision making problems from different organizations, integrating intelligent tools.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT7. ANALISIS Y SINTESIS: Capability to analyze and solve complex technical problems.

Full-or-part-time: 30h
Theory classes: 6h
Self study: 24h

Course practical assessment

Specific objectives:
1, 2, 4

Related competencies :
CG3. Capacity for modeling, calculation, simulation, development and implementation in technology and company engineering centers, particularly in research, development and innovation in all areas related to Artificial Intelligence.
CEP4. Capability to design, write and report about computer science projects in the specific area of ??Artificial Intelligence.
CEA9. Capability to understand Multiagent Systems advanced techniques, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEP3. Capacity for applying Artificial Intelligence techniques in technological and industrial environments to improve quality and productivity.
CEA7. Capability to understand the problems, and the solutions to problems in the professional practice of Artificial Intelligence application in business and industry environment.
CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.
CEP2. Capability to solve the decision making problems from different organizations, integrating intelligent tools.
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT7. ANALISIS Y SINTESIS: Capability to analyze and solve complex technical problems.

Full-or-part-time: 68h
Theory classes: 2h
Laboratory classes: 6h
Self study: 60h

Theoretical knowledge acquisition

Specific objectives:
1

Related competencies :
CEP4. Capability to design, write and report about computer science projects in the specific area of ??Artificial Intelligence.
CEA9. Capability to understand Multiagent Systems advanced techniques, and to know how to design, implement and apply these techniques in the development of intelligent applications, services or systems.
CEA7. Capability to understand the problems, and the solutions to problems in the professional practice of Artificial Intelligence application in business and industry environment.
CEA1. Capability to understand the basic principles of the Multiagent Systems operation main techniques , and to know how to use them in the environment of an intelligent service or system.
CEP2. Capability to solve the decision making problems from different organizations, integrating intelligent tools.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

CT7. ANALISIS Y SINTESIS: Capability to analyze and solve complex technical problems.

Full-or-part-time: 32h 06m
Theory classes: 8h
Practical classes: 14h
Guided activities: 0h 06m
Self study: 10h

GRADING SYSTEM

Students will be assessed on in-class oral presentations and/or their work in practical assignments. Typically, marks for oral presentations will be awarded on an individual basis, whereas marks for practical assignments will be based on an assessment of the whole group. The weighting of the final grade will be proportional to the respective workloads of the two tasks.

Examination-based assessment: Students will submit a practical exercise for assessment at the end of the course unit.

BIBLIOGRAPHY

Basic:
- Wooldridge, M. An introduction to multiagent systems. Chichester: John Wiley & Sons, 2009. ISBN 9780470519462.
- Weiss, G. (ed.). Multiagent systems: a modern approach to distributed artificial intelligence. Cambridge, Mas.: The MIT Press, 1999. ISBN 0262232030.
- Miller, J.H.; Page, S.E. Complex adaptive systems: an introduction to computational models of social life. Princeton, New Jersey: Princeton University Press, 2007. ISBN 9780691127026.
- Bellifemine, F.L.; Caire, G.; Greenwood, D. Developing multi-agent systems with JADE. Chichester: John Wiley, 2007. ISBN 9780470057476.

Complementary:
- Bordini, R.H.; Hübner, J.F.; Wooldridge, M. Programming multi-agent systems in AgentSpeak using Jason. Chichester: John Wiley, 2007. ISBN 9780470029008.

RESOURCES

Hyperlink:
- http://www.cs.ox.ac.uk/people/michael.wooldridge/pubs/- http://www.ifaamas.org/index.html