

Course MULTI-AGENT SYSTEMS

Basic Information

This is a course, which contributes to MSc award in Mathematics

Duration	216 hours (6 ECTS)
Starting date	September 1st
Study credits	6 ECTS credits
Language of instruction	English level B1(European Framework of Reference of Communicative Skills)
Academic requirements	<ul style="list-style-type: none">– BSc degree in Mathematics, Physics, Computer Science, Engineering or equivalent (a copy of your diplomas from previous university studies and transcripts of completed courses and grades)– Skype interview

Course Description

This course gives you theoretical and practical foundations of multi-agent modeling for various physical and social dynamic systems. You study an intelligent agent as a simulation model of an active element, which interacts in complex situations and strategies with other active elements and with environment to achieve a goal. The course will cover an agent's behavior algorithms in various conditions; agent technologies for identifying and predicting a state of multi-agent systems. Software implementation for models is given in the universal modeling system AnyLogic.

Special Features of the Course

The course has a detailed accompaniment in the Moodle electronic environment. The study in Moodle is facilitated through a variety of computer-mediated communication options and can be completed at the student's workplace or home.

Course Aim

- To introduce the student to the concept of an agent and multiagent system, and the main applications for which they are appropriate.
- To introduce the main issues surrounding the design of intelligent autonomous agents, and the main approaches and techniques for the implementation of such agents.
- To introduce the main issues surrounding the design of multiagent systems, and the main approaches and techniques for enabling communication and cooperation in such systems.

Course Objectives

- Acquisition of the basic theoretical concepts in the field of intelligent agents and multi-agent systems.
- Design and implementation of a multi-agent in a team to solve a complex problem.

Learning Outcomes of the Course

Upon completing this course, a student will:

- to understand what a multi-agent system (MAS) is and when they are useful,
- to be able to explain important challenges of MAS such as coordination and cooperation,
- to be able to apply some well-known distributed optimization algorithms,
- to phrase MAS scenarios using the language of game theory,
- to be able to identify or derive equilibria in normal form or extensive form games.

Course (module) Structure

Learning Activities	Hours
Lectures	18
Practice sessions / Seminars	36
Self-study Assignments	126
Final Exam (including preparation)	36
Total study hours	216

Course Outline

Week	Lectures	Practice session / Assignments	Hours ¹
1-4	Agents and multi-agent systems	- Agents, agent definitions and classification - Multi-agent systems - Home assignment No 1	52
5-8	Agent's coordination and behavior strategies	- Communication - Cooperation concepts - Establishing Organizations - Competitive Agent Environments - Coalitions - Home assignment No 2	52
9-12	Software for MAS	- Practice in AnyLogic - Home assignment No 3	56
13-18	Industrial and other applications of MAS	- Industrial MAS - MAS of biological cell - Other examples - Home assignment No 4	56
19-20		Final exam	36

¹ Hours designed for Classroom sessions, Web-sessions, Home Assignments etc.

Assessment

Grade policy for both practical home assignments and the final exam is:

- A (excellent work) 91–100 points,
- B (above average work) 81–90 points,
- C (average work) 71–80 points,
- D (below average work) 50–70 points,
- F (failed work) < 50 points.

The exam is taken orally. Each exam ticket consists of 2 theoretical questions from the list of exam questions.

The final grade includes grade for homework and exam in a ratio of 50:50.

Attendance Policy

Students are expected to attend classes regularly. However, occasional skipping classes is permissible if a student does all necessary in-class work at home.

Lecturer(s) and Tutors, Contact Information

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Core Reading

All the books are available on-line in Elsevier at SFU library.

Paulo Leitão, Stamatis Karnouskos, *Industrial Agents*, 1st Edition, *Emerging Applications of Software Agents in Industry*, Paperback ISBN: 9780128003411, eBook ISBN: 9780128004111, Imprint: Elsevier, Published Date: 12th March 2015, Page Count: 476