



ID2209 Distributed Artificial Intelligence and Intelligent Agents 7.5 credits

Distribuerad AI och Intelligenta Agenter

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for ID2209 valid from Autumn 2019

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

Having passed the course, the student should be able to:

- formulate definitions of the most important concepts and the methods for intelligent agents and multi-agent systems
- evaluate and use the most important concepts and the methods in the area for intelligent agents and multi-agent systems.

Course contents

- Introduction and basic concepts for DAI (distributed artificial intelligence).
- Coordination methods general models, joint coordination techniques, organizational structures, information exchange on the metalevel, multi-agent planning, explicit analysis and synchronisation.
- Negotiation methods: principles, protocols, production sequencing as negotiations, conventions for automatic negotiations.
- Interoperability: Methods for interoperation of software, speech acts, KQML, FIPA.
- Multi-agent architectures: Low-level architectural support, DAI-testbeds, agent oriented software development.
- Agent theory: Fundamentals of modal logic, the BDI architecture.
- Agent architectures: deliberative, reactive and hybrid architectures.
- Mobile agents: requirements, implementation, safety for mobile agents, environments for mobile agents. Agent typology and technical questions. Applications.
- Practical part of the course that contains exercises and a project that includes implementation of a multi-agent system.

Course literature

Textbook for the course:

M. J. Wooldridge. An Introduction to Multi-Agent Systems, John Wiley & Sons, 2009, Second Edition.

Lecture notes

Recommended Reading (not in curriculum):

The following articles are recommended to obtain a deeper understanding of the subject. We have provided links to the articles wherever possible.

Introduction, Overview and Terminology

- B. Moulin, B. Chaib-draa. An Overview of Distributed Artificial Intelligence. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 3-56.

- S. Franklin and A. Graesser. Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents. Proceedings of the Third International Workshop on Agent Theories, Architectures and Languages, Springer-Verlag, 1996, pp. 21-35.

Negotiation

- J. Rosenschein and G. Zlotkin, Rules of Encounter, MIT Press, 1994, ISBN 9 780262 181594. (Chapters 1, 2 and 3).
- R. Davis and R. G. Smith, Negotiation as a Metaphor for Distributed Problem Solving, (A. H. Bond and L. Gasser eds.) Readings in Distributed Artificial Intelligence, Morgan Kaufmann Publishers, 1988, p. 333-356.
- H. J. Muller. Negotiation Principles. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 211-230.

Coordination

- E. H. Durfee, Distributed Problem Solving and Planning, in Multiagent Systems (G. Weiß ed.), MIT Press, Cambridge, MA., 1999, pp. 121-164.
- N. R. Jennings. Coordination Techniques for Distributed Artificial Intelligence. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 187-210.
- H. Nwana, L. Lee, N. R. Jennings. Coordination in Software Agent Systems. The British Telecom Technical Journal, Vol. 14, No. 4, pp. 79-88.
- K. S. Decker. Distributed Artificial Intelligence Testbeds. In: G. M. P. O'Hare, N. R. Jennings (eds). Foundations of Distributed Artificial Intelligence, John Wiley & Sons, 1996, pp. 119-138.

Teamwork

- Cohen, P. R. and Levesque, H. J., Teamwork, Nous, 25, 1991.
- Tambe, M., Towards

Flexible Teamwork, Journal of Artificial Intelligence Research, Volume 7, 1997, pp. 83-124.

- G. Tidhar and A. Rao and E. Sonenberg, Guided Team Selection, In Proceedings of the 2nd International Conference on Multi-agent Systems (ICMAS-96). Kyoto, Japan, 1996.

Agent Communication

- P. O'Brien, R. Nicol. FIPA - Towards a Standard for Software Agents. BT Technology Journal, Vol. 16, No. 3, pp. 51-59, 1998.
- Y. Labrou, T. Finin and Y. Peng, Agent Communication Languages: The Current Landscape, IEEE Intelligent Systems, 1094-7167, 1999.

Mobile Agents

- D. M. Chess, C. G. Harrison, A. Kershenbaum. Mobile Agents: Are they a good idea? Research Report, IBM Research Division, T.J.WatsonResearchCenter, 1995, 21 p.
- White, J. E., Mobile Agents, in Bradshaw, J. (ed.), Software Agents, MIT Press, Cambridge, MA, 1997, p. 437-472.

Agents Overview

- M. J. Wooldridge, N. R. Jennings. Intelligent Agents: Theory and Practice. Knowledge Engineering Review, 1995, 62 p.

Agent Theory

- Anand S. Rao, Michael P. Georgeff, Modeling Rational Agents within a BDI-Architecture, Proceedings of the 2nd International Conference on Principles of Knowledge Representation and Reasoning (KR'91), 1991.

Agent-Oriented Software Engineering

- M. Wooldridge, N. R. Jennings, and D. Kinny. The Gaia Methodology for Agent-Oriented Analysis and Design. In Journal of Autonomous Agents and Multi-Agent Systems. 3(3):285-312. 2000.
- E. Kendall et al. The Layered Agent Pattern Language. Proceedings of the Conference on Pattern Languages of Programs (PLoP'97), 1997.
- B. Bauer, J. P. Muller, and J. Odell. Agent UML: A Formalism for Specifying Multiagent Interaction. In Ciancarini and Wooldridge (Eds.) Proceedings of Agent-oriented Software Engineering, Springer Verlag, Berlin, 2001, pp. 91-103.
- M. J. Wooldridge, N. R. Jennings. Software Engineering with Agents: Pitfalls and Pratfalls. IEEE Internet Computing, May/June, pp. 20-27, 1999.
- A. Tveit. A Survey of Agent-Oriented Software Engineering. NTNU CSGSC, 2001.

Agent-Mediated Electronic Commerce

- R. H. Guttman, A. G. Moukas, P. Maes. Agent-mediated Electronic Commerce: A Survey. 10 p.
- R. H. Guttman, P. Maes. Cooperative vs. Competitive Multi-Agent Negotiation in Retail Electronic Commerce. Proceedings of the Second International Workshop on Cooperative Information Agents (CIA'98), Paris, France, July 3-8, 1998, 9 p.
- J. Collins, S. Jamison, B. Mobasher, M. Gini. A Market Architecture for Multi-Agent Contracting. Technical Report 97-15, University of Minnesota, May 1997, 12 p

Additional articles in the curriculum may be added during the course

Examination

- ANN1 - Assignment, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Written examination.

In agreement with KTH's coordinator for disabilities, it is the examiner who decides to adapt the examination for students in possession of a valid medical certificate. The examiner may permit other examination forms at the re-examination of few students

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.