

Artificial Intelligence

COURSE PROGRAMME

0) Introduction to Artificial Intelligence and to the Course

1) Agent Based Models (ABM) and Multi Agent Systems (MAS): theoretical approach

1.1) Introduction

- 1.1.1 Introduction
- 1.1.2 Agents vs Multi Agent Systems
- 1.1.3 Multi Agent Systems
- 1.1.4 Examples for Agent Scenarios: Space-Scenario
- 1.1.5 Examples for Agent Scenarios: Air Traffic-Control Scenario
- 1.1.6 Examples for Agent Scenarios: Holiday Scenario
- 1.1.7 Agents vs Other Computing Approaches
- 1.1.8 MAS vs DS and CS
- 1.1.9 MAS vs AI
- 1.1.10 MAS vs GT and SS
- 1.1.11 Bibliography

1.2) Intelligent Agents

- 1.2.1 Agent definition
- 1.2.2 Simple Agent Schema
- 1.2.3 Agent Environments
- 1.2.4 Aspects of Agent-Environment Interaction
- 1.2.5 Difficulty in Designing Intelligent Agents
- 1.2.6 Agents vs. Objects
- 1.2.7 Agents vs. Expert Systems
- 1.2.8 The Intentional Stance
- 1.2.9 Abstract Architectures for Intelligent Agents
- 1.2.10 Specifying Objectives for Agents
- 1.2.11 Bibliography

1.3) Deductive Reasoning Agents

- 1.3.1 Prerequisites
- 1.3.2 Logic and Reasoning
- 1.3.3 Agents as Theorem Provers
- 1.3.4 Example: The Vacuum World
 - 1.3.4.1 Some note on the wording
- 1.3.5 Performance & Realization Issues
- 1.3.6 Agent-Oriented Programming (AOP)
- 1.3.7 Concurrent MetateM

- 1.3.8 Bibliography

1.4) Practical Reasoning Agents

- 1.4.1 Practical Reasoning = Deliberation + Means-Ends-Reasoning
- 1.4.2 Means End Reasoning
- 1.4.3 Implementing Practical Reasoning Agents
- 1.4.4 Bibliography

1.5) Reactive and Hybrid Agents

- 1.5.1 Subsumption Architecture
- 1.5.2 Limitations of Reactive Agents
- 1.5.3 Hybrid Agents
- 1.5.4 Bibliography

1.6) Multi-Agent Interactions

- 1.6.1 Agent Societies
- 1.6.2 Utilities and Preferences
- 1.6.3 Multi-Agent Encounters
- 1.6.4 Dominant Strategies and Nash Equilibria
- 1.6.5 Competitive and Zero-Sum Interactions
- 1.6.6 The Prisoner's Dilemma
- 1.6.7 Other symmetric 2x2 Games
- 1.6.8 Dependence Relations in MAS
- 1.6.9 Bibliography

1.7) Reaching Agreements

- 1.7.1 Reaching Agreements
- 1.7.2 Mechanism Design
- 1.7.3 Auctions
- 1.7.4 Negotiation
- 1.7.5 Negotiation: Task Oriented Domains
- 1.7.6 Negotiation: Worth Oriented Domains
- 1.7.7 Argumentation
- 1.7.8 Bibliography

1.8) Agent Communication

- 1.8.1 Agent Communication
- 1.8.2 Speech Acts
- 1.8.3 Agent Communication Languages
- 1.8.4 Bibliography

1.9) Working Together

- 1.9.1 Working Together
- 1.9.2 Task Sharing and Result Sharing
- 1.9.3 Handling Inconsistency
- 1.9.4 Coordination
- 1.9.5 Bibliography

2) Agent Based Models (ABM) and Multi Agent Systems (MAS): hands-on activities

2.1) Introduction to NetLogo

- 2.1.1 Introduction
- 2.1.2 History
- 2.1.3 World description
- 2.1.4 Graphic interface
- 2.1.5 Programming in NetLogo
- 2.1.6 A NetLogo model: Termites

2.2) Defining research activities

- 2.2.1 Forming groups
- 2.3.2 Model selection
- 2.3.3 Hands-on activity

3) Machine Learning (ML) and Deep Learning (DL)

3.1) T.B.A.