

Change of Title and Focus of COMP 4418:

Background:

The history of the course **COMP 4418 (called Knowledge Representation & Reasoning)** is that it was a heavily logic focussed course taught by Michael Thielsher or Maurice Pagnucco. In 2017, Haris Aziz joined the course and introduced relatively independent content on multi-agents aspects including game theory, social choice. Around 2019, the course was taken over by Abdallah Saffidine. Around 2021, Abdallah changed the course quite a bit by focussing much more on answer set programming / declarative programming.

When Abdallah left in 2024, Haris Aziz was asked to completely take over the course on short notice. He expanded his previous core content (on multi-agent systems) to assume the main part of the course in 2024.

Proposed Amendment:

We want the course outline and title to more accurately reflect the new balance of content of the course. The course is now more focussed on foundations of multi-agent systems which is a branch of AI with significant overlap with Knowledge Representation and Reasoning. The main changes are a revision of the title as well as some aspects of the outline of the course. The value of a course name 'multi-agent systems' is high: it is a sizeable branch of AI and has a flagship conference (AAMAS (CORE A* with around 900 attendees) and flagship journal JAAMAS). The content of the course is the same as last year and has significant overlap with previous editions.

The content of the course can be taught by Haris Aziz. It can also be taught by other members of the Algorithmic Decision Theory Group such as Toby Walsh or junior postdocs at ADT.. If needed, Serge Gaspers is also familiar with the content.

OLD TITLE: Knowledge Representation and Reasoning

PROPOSED NEW TITLE: Multi-agent Systems

OLD Course Aims

This course provides an introduction to the important approach to symbolic Artificial Intelligence (AI) known as Knowledge Representation and Reasoning (KRR). KRR has a long and distinguished history of research in AI with a broad range of approaches. In this course we concentrate on formal approaches to KRR, in particular logic based approaches – propositional logic, first-order logic, non-monotonic logic – and how they can be used to solve difficult computational problems.

Proposed New Course Aims

This course provides an introduction to the important subfield of Artificial Intelligence (AI) known as Multi-agent Systems. Multi-agent Systems has a long and distinguished history of research in AI with a broad range of approaches. In this course, we concentrate on the algorithmic and game-theoretical foundations of multi-agent systems. We will cover fundamental concepts from decision theory, non-cooperative game theory, cooperative game theory, multi-agent resource allocation, social choice, and market design to solve important multi-agent problems.

OLD learning outcomes

CLO1

Identify when a given situation can be formulated with a Knowledge Representation and Reasoning (KRR) approach

CLO2

Implement a problem model in a KRR language and use existing KRR tools to identify a solution

CLO3

Break down a task into its domain vocabulary and its combinatorial dimension

CLO4

Solve new combinatorial problems using declarative programming

Proposed learning outcomes

CLO1

Identify when a given situation can be formulated with a Multi-agent Systems approach

CLO2

Implement a problem model as a multi-agent scenario and use axioms and algorithms to identify a solution

CLO3

Break down a problem into subproblems using a multi-agent methodology

CLO4

Solve new combinatorial problems using game theory and social choice tools in multi-agent systems.